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ABSTRACT

This document presents witness testimony and supplemental materials from a Congressional hearing focused on the role of technology in promoting distance learning in the United States. Distance learning programs make educational resources available to citizens, regardless of socioeconomic status or geographic location, and enable citizens to remain competitive with each other and with other countries. Issues of cost and funding for distance learning are discussed. The document features an opening statement by Senator Conrad Burns, Chairman of the Subcommittee on Science, Technology, and Space; and statements by Senator Ernest F. Hollings, Senator John D. Rockefeller IV, Senator J. James Exon, and Senator Larry Pressler. Testimony and prepared statements are included from the following witnesses: (1) Kimberly K. Obbink, director of Distance Learning and Instructional Telecommunications at Montana State University; (2) Janet K. Lewis, Ph.D., Dean of Continuing Education, University of South Dakota; (3) Henry Marockie, Ph.D., West Virginia State Superintendent of Schools; (4) Jessica Lambert, Distance Learning Student, Mount View High School, Welch, West Virginia; (5) Patrick Portway, founder and executive director, U.S. Distance Learning Association; (6) Linda G. Roberts, Ph.D., director, Office of Educational Technology, U.S. Department of Education; (7) Kenneth C. Elliott, assistant professor of psychology, Division of Social and Behavioral Sciences, University of Maine at Augusta; (8) Shelly Weinstein, president and CEO, National Education Telecommunications Organization; (9) Pat Wright, senior vice president of Education, ETC, with Telecommunications, Inc.; (10) David W. Jupin, general manager of Network Systems, COMSAT RSI; (11) Carl E. Swearingen, president, Georgia BellSouth Telecommunications, Inc.; and (12) Sally M. Johnston, Ph.D., director, Western Cooperative for Educational Telecommunications, Western Interstate Commission for Higher Education. (SWC)

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EDUCATIONAL SATELLITE LOAN GUARANTEE PROGRAM ACT, AND DISTANCE LEARNING

HEARING

BEFORE THE

SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED FOURTH CONGRESS

SECOND SESSION

APRIL 24, 1996

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ONE HUNDRED FOURTH CONGRESS

SECOND SESSION

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HEARING ON S. 1278, EDUCATIONAL SATELLITE LOAN GUARANTEE PROGRAM ACT AND DISTANCE LEARNING

WEDNESDAY, APRIL 24, 1996

U.S. SENATE,
SUBCOMMITTEE ON SCIENCE, TECHNOLOGY, AND SPACE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The subcommittee met, pursuant to notice, at 9:38 a.m., in room SR-253 of the Russell Senate Office Building, Hon. Conrad Burns (chairman of the subcommittee) presiding.

Staff members assigned to this hearing: Louis C. Whitsett, staff counsel, and Timothy B. Kyger, professional staff member; and Patrick H. Windham, minority senior professional staff.

OPENING STATEMENT OF HON. CONRAD BURNS, U.S. SENATOR FROM MONTANA

Senator BURNS. This subcommittee will come to order, now that our vice chairman is here. Thanks for joining us for this morning, Senator Rockefeller, and good morning.

This morning we are going to have a hearing that will focus on the role of technology promoting distance learning here in the United States. As chairman of the Science Committee, I feel strongly that we must do our best in promoting the cutting edge technology in satellite communications and computing technology to help solve some of our problems and challenges that we find in education. From Montana to West Virginia, local school districts are being asked to do more with less. In rural areas and regions there are special problems for lack of access to educational opportunities and, of course, resources.

Oftentimes, hundreds of miles separate our elementary and secondary schools from our colleges and our universities within a State, and just as technologies have historically helped this Nation to meet difficult challenges in aviation and communications, industrial competitiveness, the national defense, I am confident that technology will lead to a dramatic improvement in the way we educate our young people, as well as our adult citizens, in continuing education programs.

I want to place a lot of emphasis on adult continuing education, for the simple reason that technology changes. We know that it is changing much, much faster now, than it did, say, just 20 years ago. Turnover in technology is constantly occurring resulting in new technology coming on line. It displaces workers. We are seeing that more people will have four or five or seven different jobs in their lifetime. One reason is because of this new technology. It displaces these people. We have to find a way of educating our mature work force on doing things differently and learning new things every day in order just to keep them abreast of what is going to be desired from them in the new workplace.

We are already starting to see the applications of advanced technology to education and the distance learning movement using copper wire, fiber optics, satellite. Distance learning programs around the country are working hard to make our vast educational resources more accessible to our citizens, regardless of socioeconomic status or geographic location. Today, more than 90 American colleges provide education and instruction through K through 12 school districts, libraries, and through other national and regional distance learning programs, and these programs enable students and teachers in remote locations to receive specialized instructions in math, science, foreign language, and many other disciplines that otherwise would not be available to them. Many of the programs are a result of partnerships among the colleges and the business community, State, and local governments who share a belief that the future of our country depends on a successful communication system.

Earlier this month, the Washington Post featured an article about distance learning which suggested that distance learning may be the most significant development in higher learning in recent years. Increasingly, distance learning is being recognized as a vital and necessary component to the curricula of any college that hopes to stay competitive. In many classes which employ distance learning, fewer than a third of the students are physically in the classroom with the professor. The remaining students are in remote sites equipped with television monitors as well as microphones, which allow those students to talk and interact with the teachers.

With greater numbers of students receiving their educations through distance learning, many schools are in effect developing virtual campuses consisting of professors' home site and many electronically linked remote sites. This virtual campus has not only expanded the access to a school's educational programs, but they have generated a whole new population of students—adult students, with jobs and families who like to be added to that business called flexibility in the work place. An educated population is in the national interest, and I believe it is appropriate for Congress to seek creative ways to encourage the growth and development of distance learning activities.

I founded the Montana Telecommunications Advisory Council in the State of Montana, along with the Government, just to inventory our needs, what we have, and what our needs are going to be for the future, as far as telecommunications and how it fits in, not only in distance learning, but also in telemedicine and other applied resources we can use in the State. Of course, it is going to move our economy. I am determined on that. We work through the Telecommunications Competition Deregulation Act of 1995. It was an idea that, sure, we had passed in 1995, but this idea started in this committee a long time before that. Back in 1989 when I first came to this Congress, and, of course, Senator Rockefeller was here, we offered the first amendment for video dial tone and it shocked this room. It got very, very quiet in here for a long time.

Last year I introduced a bill to the committee to establish a loan guarantee program for the Commerce Department which would help nonprofit institutions via satellite systems deliver educational programs. The EDSAT bill would address two barriers faced by those involved by distance learning by satellite. It would ensure instructional programmers affordable transmission times without risk of preemption by the commercial user. In addition, it would allow education program users to focus their receiving dish on just one satellite rather than having to search the sky for multiple satellites.

I am also proud to serve as the honorary chairman of the Telecommunications Center at Montana State University. If we are going to capitalize on these new opportunities, we have to start training our teachers how to use the technology. Increasing public access to lifelong learning, especially for isolated individual communities, enhancing teaching and learning, keeping instructions affordable, and expanding the partnerships between universities and private and public organizations are important.

I am going to put the rest of my statement in the record, but I would like to say that we are seeing today the new technologies in distance learning. If we really believe education is the cornerstone to this great Nation and how we are perceived around the world, then it is desirable that this technology become an important part of the infrastructure of this country.

[The prepared statement of Senator Burns follows:]

PREPARED STATEMENT OF SENATOR BURNS

This hearing will now come to order. Good morning and let me welcome our distinguished group of witnesses with us today.

This hearing will focus on the role of technology in promoting *distance learning* in the United States. As Chairman of the Science Subcommittee, I feel strongly we must do our best in applying cutting-edge satellite, communications, and computing technologies to help solve our problems and challenges in education. From Montana to West Virginia, local school districts are being asked to do more with less. In rural areas and regions, there is the special problem of lack of access to educational resources. Often times, hundreds of miles separate our elementary and secondary schools from colleges and universities within the State. Just as technology has historically helped our Nation meet difficult challenges in aviation, communications, industrial competitiveness, and national defense, I am confident that technology will lead to dramatic improvements in the way we educate our young people, as well as our adult citizens in continuing education programs.

We are already starting to see this application of advanced technology to education in the distance learning movement. Using copper wire, fiber optics, or geostationary satellites, distance learning programs around the country are working hard to make our vast educational resources more accessible to our citizens regardless of socioeconomic status or geographic location. Today, more than 90 American colleges provide education and instruction to K–12 school districts, libraries, and others through national and regional distance learning programs. These programs enable students and teachers in remote locations to receive specialized instruction in math, science, foreign languages, and many other disciplines that otherwise would not be available to them. Many of the programs are the result of partnerships among colleges, businesses, and State and local governments who share a belief that the future of our country depends on successfully educating our young people.

Earlier this month, the *Washington Post* featured an article about distance learning which suggested that distance learning may be the *most significant development in higher learning in recent years*. Increasingly, distance learning is being recognized as a vital and necessary component of the curricula of any college that hopes to stay competitive. In many classes which employ distance learning, fewer than a third of the students are physically in the classroom with the professor. The remaining students are in remote sites equipped with television monitors as well as microphones which allow the students to talk to the teachers. With greater numbers of students receiving their education through distance learning, many schools are, in effect, developing *"virtual campuses"* consisting of the professor's home site and the many electronically-linked remote sites. These virtual campuses have not only expanded access to schools' educational programs, but they have generated a whole new population of students—adult students with jobs and families who like the added schedule flexibility of the distance learning programs. These distance learning programs are preparing our citizens for the new work place.

An educated population is in the national interest and I believe it is appropriate for Congress to seek creative ways to encourage the growth and development of distance learning activities. I am strongly committed to providing rural communities with affordable telecommunications technology. I believe that cost-effective communications technologies can connect Montanans as well as all Americans with learning and information resources wherever they may be located. Recently, I have been working through several avenues to facilitate public education.

I founded the Montana Telecommunications Advisory Council (MTAC), along with the Governor, to inventory the telecommunications resources within the State and to serve as an advisory group to me as to the directions that Federal policies should move to direct this important new sector of the economy.

I worked, through the Telecommunications Competition and Deregulation Act of 1995, to insure that all Americans, urban or rural, gain access to the most advanced telecommunication capability as quickly as market forces allow. Universal service is especially important in lesser-populated areas where competition will be slow to evolve. This legislation promotes services, including interactive video and Internet, to elementary schools, secondary schools, and libraries.

Last year, I introduced a bill now pending in the Committee to establish a loan guarantee program at the Commerce Department which would help non-profit institutions buy satellite systems to deliver educational programming. My *EDS4T* bill would address two barriers faced by those involved in distance learning via satellite. It would ensure instructional programmers affordable transmission times without risk of preemption by commercial user. In addition, it would allow educational program users to focus their receiving dish on just *one satellite* rather than having to search the skies for multiple satellites.

I am also proud to serve as the honorary chairman of Montana State University Telecommunications Center. This Center is a laboratory created to seek solutions to several of the critical challenges facing public education. These challenges include:

1. Increasing public access to lifelong learning, especially for isolated individuals and communities,
2. Enhancing teaching and learning,
3. Keeping instruction affordable, and
4. Expanding partnerships between universities and public/private organizations.

The purpose of this hearing is to gather input from our witnesses representing the educational, satellite, and telecommunications communities about their experiences with distance learning and to hear their suggestions on how Congress might provide help for our distance learning programs. To give the Subcommittee a better sense of what distance learning is all about, with the help of our witnesses, we have arranged for a distance learning demonstration today. I am particularly looking forward to that portion of the demonstration that will allow us to observe and interact with a distance learning program which is part of the National Science Foundation's Systemic Initiative for Montana Mathematics and Science awarded to the Montana Council of Teachers of Mathematics.

In this demonstration, a doctoral student at the University of Montana in Missoula will interact with third grade students at Margaret Leary Grade School in Butte as they participate in an abacus lesson.

For citizens in our rural States, distance learning is critical to both the education of young people and our economic competitiveness in the new work place so it is important we find ways to promote and develop that capability. Let me take this opportunity to thank our witnesses for helping to put this demonstration together and to especially thank PictureTel Corporation, U.S. West, the University of Montana, and Montana Tech, which provided the technological assistance to ensure its success.

Again, let me welcome our witnesses here today and I look forward to hearing their testimony.

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STATEMENT OF SENATOR HOLLINGS

Prepared Statement of Senator Hollings

New communications technologies offer great promise for our country, and education will be one of the most important applications. Already, we have seen valuable educational uses of these new technologies, and I hope to see more in the years ahead. The hearing today will help the Committee assess how far we have come and how much farther we can go.

The hearing today also offers several important lessons. First, some of the key technologies which make distance learning possible—such as communications satellites and the Internet—were developed initially with strong support from the Federal Government. Now that these technologies are developed and proven, a vibrant private sector has made them into commercial successes. Distance learning becomes one more example of how long-term public investments in new technologies pay off for the country.

Second, the distance learning experiments discussed today also illustrate the importance of affordable access to telecommunications services. All parts of our country need that access. That is a key principle of the new Telecommunications Act, and one of which I am proud.

Third, these experiments show the imagination of our educators in using new technologies to improve learning for our children. Education is the best investment we can make in America's future, and today's witnesses illustrate the valuable efforts being made to apply new technology to the improvement of education, especially in rural areas.

I look forward to reviewing the testimony of our witnesses.

Senator Burns. I want to introduce Senator Rockefeller and thank him for coming today.

Senator Rockefeller.

STATEMENT OF HON. JOHN D. ROCKEFELLER IV, U.S. SENATOR FROM WEST VIRGINIA

Senator Rockefeller. That was a good statement. Why did you cut it off there with only a page and a half to go. That was a good statement.

Senator Burns. Well, my staff wrote the first part and I wrote the second part. [Laughter.]

Senator Burns. Now, you understand, is that correct?

Senator Rockefeller. I thought it was interesting.

Mr. Chairman, as usual, you are doing a super job, and you have put your finger right on a lot of the excitement going on in our States and around the country. Our topic, distance learning, is very, very close to your heart and very close to mine, and getting a lot closer. It is essential that Senators from States like Montana and West Virginia feel that way, because we have an enormous amount to gain from it, as does the whole country.

I want to thank all of our witnesses for coming today, and I obviously especially want to introduce our West Virginia witnesses. One is Jessica Lambert. Are you a junior or a sophomore?

Ms. Lambert. A sophomore.

Senator Rockefeller. At Mount View High School in Wells, WV, and you should understand, Mr. Chairman, that Mount View High School is built on top of a strip mine job. There is no flat land in which to put a High School in McDowell County. So literally, they had to wait until they did a big strip job, and then they flattened off the top of a mountain and they put the school up there. Actually, parts of the school have sunk somewhat, have they not, just a little bit? [Laughter.]

Senator Rockefeller. But I guess they have repaired all that.

Dr. **Marockie**. The strip was not very good, Senator. [Laughter.]

Senator **Rockefeller**. Also, along with Jessica, is my very good friend and long-time associate Hank Marockie, who is the superintendent of West Virginia Schools, and is about to become head of all State school chiefs, am I right?

Dr. **Marockie**. That is correct, Senator.

Senator **Rockefeller**. Do you get a salary increase for that? [Laughter.]

Is Patsy Paine here?

Dr. **Marockie**. She is in the back.

Senator **Rockefeller**. Well, Patsy, you need to be recognized, too, because you are a staff member at the high school and you are chaperoning Ms. Lambert, and that is a good idea in Washington, DC. [Laughter.]

Senator **Rockefeller**. I had somebody murdered in my front driveway, did you know that, Jessica? It was a drug killing. It is a tough city to live in, so we can be very happy about the West Virginians and Montanans. Mr. Chairman, I invited Ms. Lambert, and Dr. Marockie to testify because of the fact, really, that Jessica is living proof of the importance of distance learning, and I will get into that in a second.

Education technology obviously offers new ways for raising the quality of education for all students, including students in very isolated counties like Jessica comes from. We have to pursue that goal. The global economy of the 21st century is not going to hit McDowell County except as it exports what little bit of coal is left there, metallurgical coal, unless we do it through what we are talking about here this morning. We have to have higher skills, backgrounds in fields like science and computers and economics, and in Jessica's case, the Japanese language.

Technology bridges a gap for rural schools when distance or mountains or remoteness just make it very, very hard.

Instead of having to consolidate everything so that you can afford more technology, schools can turn now to these new technologies to bring learning into the classroom, wherever it might be. That is the way, and that is ultimately what we care about, the way you do not get a two-tiered system in America of the haves and the have-nots and the big schools who can afford it and the little rural schools that cannot.

Again, McDowell County is strapped economically in a lot of ways, but with a lot of terrific people in it, and Jessica and her fellow students need and deserve exactly the same type of education, with all of its nuances and technology, that, let us say, some student in Beverly Hills, CA, gets, or Lake Forest, IL. There cannot be a two-tier system. That brings me just to a closing thought here.

Senator Snowe and a lot of us introduced a special provision called the Snowe-Rockefeller-Exon-Kerrey. It is known as SREK. Then it passed the Senate with a terrific margin—big, big, big margin. It is a very interesting thing, because it is the pursuit of telecommunications reform, and it is particularly aimed right at rural States, and it is aimed at K through 12, not private schools but public schools, public libraries, rural health centers, rural hospitals, et cetera, so that they can get a direct on-ramp to the information superhighway. I think the chairman feels the same way that I do, that we should not ignore anybody because of where they happen to be born.

I have got to report to you that this was hammered out at great length and with great difficulty with the Bell Companies, with the Big Seven in the Telecommunications Act, which was a huge piece of legislation which we passed earlier this year, and we finally got them to accept this. Now, they are all backtracking. They are all backtracking, and they are trying to do something which is insidious, and which I want all of you at the witness table to be aware of, and our listening audience to be aware of.

They are trying to get out of the so-called discount rate that would affect, let us say, Mount View High School. Mount View High School maybe has all kinds of computers, but those things have got to be hooked up. Year after year you have got to pay for them, they become extremely expensive—I will get into that later, too, not in this talk, but later on. It is very, very expensive, and it is the discounted rate which allows the rural and remote schools and libraries to get the same access to information.

What they are doing is saying we are going to do it based upon student population count, and I am going to ask you about that a little later, Hank, what that would mean. In other words, it is just according to the number of kids in the State, that is, the number of dollars you get, which, of course, is the classic way of just sticking it to Montana, West Virginia, Maine, and all the rest of us. Bob Kerrey, Olympia Snowe and I, and Jim Exon have written a stiff letter to Reed Hundt, who believes this. He agrees with us.

But we have to really be careful about those Bell Companies. I mean, NYNEX and Bell Atlantic just had this huge merger, the biggest merger in history virtually, and they have got to do the right thing by our kids in our rural areas, and they cannot be allowed, with their hundreds and hundreds of lawyers, to try and sneak around this as they face the joint State-Federal Board, et cetera, that the FCC has set up.

So I just wanted to say that, and thank my esteemed chairman.

Senator BURNS. Thank you very much. Senator Rockefeller has done a lot of work in this area, and of course I have served with him on these issues when he was chairman, and now as I am chairman. It is very important to our States.

This morning the witness panel is just great. Kim Obbink is here, director of Distance Learning and Instructional Telecommunications, Montana State University of Bozeman, MT. Kim, thanks for coming today. There are a lot of exciting things happening at MSU, and we look forward to hearing about them. We are also going to have a demonstration in a little bit, from Missoula and Butte. Several of the leading companies in Montana have contributed to this in making it possible. The exciting distance learning project that we are going to view is why we set up the Montana Telecommunications Advisory Council (MTAC), and that is why I think that MTAC is very, very important to our State. Thank you for coming this morning. We look forward to hearing from you.

[Prepared statement of Senator Rockefeller follows:]

Prepared Statement of Senator Rockefeller

Thank you, Mr. Chairman. This hearing is a great opportunity for us to learn about some very exciting developments in our States and around the country. Our topic, "distance learning," has enormous potential to improve education, especially in rural areas like West Virginia and Montana.

I want to thank each and every witness for coming this morning, but I must take this opportunity to especially welcome our West Virginia guests:

Jessica Lambert, a sophomore at Mount View High School in Welch, West Virginia.

A good friend and dedicated educator, Dr. Hank Marockie, our Superintendent of West Virginia Schools.

I'd also like to recognize Patsy Payne, a staff member of Mount View High School, who is chaperoning Ms. Lambert here today.

I invited Ms. Lambert and Dr. Marockie to testify because of West Virginia's ongoing efforts to promote education technologies for distance learning. Jessica is "living proof" of the importance of distance learning.

Education technology offers new tools for raising the quality of education for all students. And we have to pursue that goal. The global economy of the 21st Century is already demanding more education from our workforce, higher skills, and background in fields like science, computers, and economics.

Technology bridges a gap for rural schools, when distance or mountains or remoteness make it impossible to recruit a top-notch language or science teacher. Instead of turning to consolidation, schools can turn to these new technologies to bring learning into the classroom. This can help end the two-tier education system by opening the door for small, isolated schools to offer a range of challenging and diverse courses. Jessica is from McDowell County, one of the poorest counties in my State, but she and her fellow students need and deserve the same high quality education that students in some cities and wealthy suburban schools have—and it's possible with distance learning and other innovative education technologies.

As most members of this committee will remember, I fought passionately for a special provision—the Snowe-Rockefeller-Exon-Kerrey amendment—during the pursuit of telecommunications reform. I did so to ensure that schools, libraries and rural health care providers get affordable access to the information superhighway which has such potential to change education, learning, and health care. We should not leave any school or region of our country behind the exciting changes promised by modern telecommunications. Linking up schools and libraries assures that every student and every American can get access to the information superhighway in their own community.

Distance learning is just one example of the innovative education technologies that will be considered as special and advanced telecommunication services. Because of this technology, a student like Jessica from a rural town can study Japanese. But unfortunately, too many schools and libraries can't take advantage of this promising technology because of high telecommunications costs and the other ongoing expenses of advanced education technology.

Our provision in the Telecommunications Act was designed to guarantee discounts to make access affordable. With the help of our provision, States and local schools have more reason to invest in education technology. Our amendment is an incentive, and a Federal partnership with States and local communities to ensure that every school and library—rural or urban—can count on affordable access. Every American deserves that chance to tap into our information superhighway and reap its benefits.

Thank you, and I look forward to this hearing.

STATEMENT OF KIMBERLY K. OBBINK, DIRECTOR OF DISTANCE LEARNING AND INSTRUCTIONAL TELECOMMUNICATIONS, MONTANA STATE UNIVERSITY, BOZEMAN, MT

Ms. Obbink. Thank you, Senator Burns.

My name is Kim Obbink. I am director of Distance Learning and Instructional Telecommunications at Montana State University, Bozeman. In 1993, MSU committed to refocusing the university's outreach mission by using cost-effective communications technologies to connect Montanans with learning and information resources wherever people are located. In its refocus, MSU insists that the needs of teachers and learners be put ahead of the technical systems. The reverse has caused great expense and diminished learning opportunities in many cases.

In creating a major telecommunications initiative, the university is responding to significant trends that are occurring in our society. This is truly an exciting time for education. The rules are changing. Traditional boundaries and barriers no longer exist, and the opportunities created by new distance learning technologies are endless. Important advantages, particularly in rural areas like Montana, include meeting the needs of people where they live and work, economic development opportunities, immediate access to resources, addressing equity issues and leveling the playing field for minorities and rural populations, improving K–12 education, enhancing the ability to compete in a global economy, and reducing the barriers of distance and time.

There are also many challenges to taking advantage of these new opportunities. The first challenge is to focus on the people and the program, and remember that the technology is only a means to an end. There are many examples of systems that do not connect to anything of value to their clientele. A Missoula high school science teacher enrolled in several of our on-line courses at MSU describes this critical issue by saying these distance learning courses are highly successful, not because they are electronic, but because they are human.

The second challenge is to focus on affordable and accessible technology. In order to be successful, distance learning must be affordable and accessible. People need affordable access to high-speed infrastructures that will allow them to connect to a variety of systems. People living in rural areas in particular need access to unbiased technical expertise in sorting out the complex issues involved with investing in these new technologies.

The third challenge is to focus on flexibility. At MSU we call this the 3 a.m. basement test. If we are not designing programs that are accessible to students at 3 a.m. in their own home basement, then we are still not preparing to meet the future expectations and needs of our audience. Experience indicates that this is not just a rural issue. Anytime/anywhere access will become more and more essential.

The power of these new technologies does not lie in the bandwidth or the fiber, but it lies in what happens to the lives of the people they touch. Several examples illustrate our experience in Montana, and are representative of what is happening throughout the Nation. The first story comes from the mother of a Crow Indian high school student from Busby, MT, population 452. She tells me the story about how she cannot believe how much her son has changed. Last year he attended a minority apprenticeship program at MSU, and then returned home, thanks to a partnership with IBM, with a laptop computer and a modem. Since that time he no longer hangs out at the local gas station after school every night until midnight, but comes home and spends hours on-line talking to scientists and faculty at different institutions across the country.

Another story is about Cody Tibbits, who is from Terry, MT, population 627, and currently surrounded by FBI, Freemen, and CNN reporters. Cody attended an NSF program sponsored at Montana State University called Young Scholars, and again went home with access to a computer and a modem, and on-line connections to faculty and his peers around the State for 3 years until he finished high school. When I first met Cody, he had never been out of Terry before, and Cody is now finishing his freshman year at Harvard, because, as he describes it, the world suddenly became a much bigger place.

David Heuck is a rancher near Miles City, which is 290 miles from the MSU campus. Using his computer and modem, supplemented by interactive video sessions, David took classes in water quality and got his questions answered by specialists without having to leave the ranch and the work that keeps him there. The course gave him insights into his own water practices, and as a result he has changed his farming practices to the advantage of water quality on the Yellowstone River, which runs past his farm.

The last story is of a single mother and high school science teacher who lives just across the Montana border into Canada who is taking on-line courses from MSU. Late at night she writes to the professor and leaves this message: "This is a dream come true for me. It is 40 degrees below zero, my children are asleep, I live 200 miles from the nearest, and I am able to go to class and may someday be able to fulfill my goal of having a masters degree. Without this distance learning option, this would never be possible."

In summary, I would say there are four issues affecting rural populations that I think are crucial to the eventual success of these distance learning opportunities. The first is access, that we need greater access. In many cases it is not even a matter of affordable access, it is actually physical access to appropriate phone line dial-up connections and high speed connections which will allow people to gain access to these new systems.

Another issue is interoperability. In Montana I can think of, just offhand, eight different interactive video systems that do not connect to one another. So consequently, people have access to the technology but the systems do not talk to one another, or at least do not talk easily to one another.

The third issue is the need to focus on programs that meet people's needs. There is currently a lot of money being put toward the technologies, and very little being put toward the programs that will be delivered using those technologies.

The forth is the technical support to avoid mistakes, that people living in rural areas often do not have the technical expertise. Even when they want to invest in the technologies, they do not have the appropriate advice from people with broad-based, sustainable, and long-term vision for the future.

Thank you for supporting all of these efforts.

[The prepared statement of Ms. Obbink follows:]

MONTANA
STATE UNIVERSITY
BOZEMAN

Kimberly K. Obbink
Director of Distance Learning
& Instructional Telecommunications

Senate Committee on Commerce, Science,
and Transportation

Hearing Testimony

April 24, 1996

Science, Technology and Space Subcommittee Hearing on Distance Learning
April 24, 1996
Testimony of Kimberly K. Obbink, Director
Distance Learning and Instructional Telecommunications
Montana State University-Bozeman

Good Morning, Senator Burns and members of the committee, my name is Kimberly K. Obbink and I am the Director of Distance Learning and Instructional Telecommunications at Montana State University-Bozeman.

We've all heard about how the information superhighway and modern telecommunications can change the way that we live, work and learn. Here at Montana State University, we are using telecommunications to erase the boundaries of the campus and extend the university into the homes and work places of every Montanan, regardless of location. What we're trying to do with our scarce resources is to offer every Montanan equal access to their State University. We believe this is a model for higher education in the 21st Century. The test bed is rural Montana, but the implications are profound for education across America and the world.

-Michael P. Malone, President
Montana State University

THE BURNS TELECOMMUNICATIONS CENTER MONTANA STATE UNIVERSITY - BOZEMAN

Challenges and Opportunities in Distance Learning

Throughout the world, communication and information technologies are making it possible to overcome the limitations of time and place and are rapidly changing the way people live, work and learn. As a land grant institution Montana State University's traditional outreach mission is to extend its programs and resources in education, research and service to all peoples. In 1993, MSU committed to refocusing the University's outreach activities using cost-effective communications technologies to connect Montanans with learning and information resources wherever they are located.

In creating a major telecommunications initiative, the University is responding to significant trends that are occurring in our society. These include:

- Increased demand for lifelong learning and continuing education opportunities;
- Increased requirements for continuing professional education and certification;
- Growing desire for individual access to information resources on demand;
- Movement toward conducting business from dispersed sites;
- Need to provide professional support in isolated areas to maintain presence;
- Need to foster rural economic development opportunities; and
- Reduced financial resources for support of university and public services.

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The challenge in Montana is to extend services across great distances to audiences that are small and widely scattered. Montanans number only a few more than 800,000 and reside in the nation's fourth-largest state. A sparse and widely-dispersed population, limited financial resources to call upon, and enormous distances to span have caused this University to take advantage of new technologies to deliver programs and services. Unlike the telecommunications initiatives underway in many states, which include new and expensive infrastructures, MSU has taken a different approach: low cost, highly accessible, flexible systems that use existing infrastructures. This strategy has positioned Montana State, among its land grant peers, as a leading provider of instructional programs and technical assistance using accessible and affordable technologies.

Opportunities in Distance Learning:

The opportunities created by new distance learning technologies are endless. Important advantages include:

- Meeting the needs of people where they live and work,
- Economic development opportunities,
- Immediate access to resources,
- Addressing equity issues and leveling the playing field for minorities and rural populations,
- Improving K-12 education,
- Enhancing the ability to compete in a global economy, and
- Reducing barriers of distance and time.

Montana State University's strategy is unique. The needs of the content, instructor and the audience precede technical design of the programs. Many institutions have focused on acquiring a specific technology first and then planning their programs around it with the result that systems are too costly or ineffective. Current MSU distance learning programs use Internet and dial-up online services, two-way interactive video networks, public television and satellite broadcast.

For Montanans, this means that there are more opportunities now than ever before to obtain education, training and lifelong learning from home or near home. Montanans can now tap into a whole host of University resources which include, business and technical assistance, professional development and teacher enhancement. Our experience tells us that distance learners and participants feel less isolated professionally and personally, as they network with peers from around the state and the nation.

In addition, distance learners and instructors report that they become more actively involved and engage in collaborative learning in this new environment. For higher education, this means that we must become more attuned to the educational needs of a non-traditional audience and change the way we do business in delivering education.

More professional development opportunities exist at times that are convenient to professionals. Extension Service agents are able to conduct training sessions without having to travel great distances. In short, Montanans benefit from money used more efficiently.

Challenge #1: Focus on People and Programs

The primary challenge in this new environment is to remember that the technology is only means to an end. The technology allows us to focus on the people and the programs that will be valuable to them. Currently, a great deal of money is spent on technology while very little is spent on programs and resources to be delivered. Many examples exist of distance learning equipment that goes unused because it does not connect to anything of value to the clientele. In MSU's distance environment the focus is directed at the learners and their needs. A Missoula high-school science teacher enrolled in online courses describes this critical issue, "These (online) courses are highly successful, not because they are electronic but because they are human."

Challenge #2: Focus on Affordable and Accessible Technology

In order to be successful distance learning must be affordable and accessible. People, particularly in rural areas, need affordable access to high speed infrastructures that will allow them to connect to a variety of systems. In addition the issue of interoperability needs to be addressed. In Montana alone there are eight different interactive video networks that do not easily connect to one another without advanced technical support that is seldom available. There are many examples of distance delivery systems that go unused because they are too expensive to operate or maintain, there are no appropriate programs available, or there is no technical expertise to help people use the system. People living in rural areas in particular need access to unbiased technical help in sorting out the complex issues involved with investing in technology.

Challenge #3: Focus on Flexibility

Education and resources on-demand will increasingly become a reality. In a state like Montana the greatest distance learning access is a computer and modem connection. In many cases people would still have to travel several hundred miles for educational opportunities. Our goal is to provide education and resources to people at a location and time that best meets their needs.

MSU asks itself an important question. Are our off-campus programs and courses accessible at 3:00 am from a student's basement? The answer to this question immediately puts into perspective the availability of any program we deliver. If we are not designing programs that are accessible to students at 3:00 am in their own home basement, then we are still not preparing to meet the future expectations and needs of our audience. Experience indicates that this is not just a rural issue. Asynchronous communication allows people to interact effectively with one another, participate in a class discussion, ask questions of the professor, and collaborate on course work, all from times and locations that meet the individual's needs.

The Power of Distance Learning:

The power of these new technologies to transform the lives of Americans is truly revolutionary, but it is not found in the bandwidth or the fiber. Instead, the power lies in what happens to the lives of the people they touch. Several examples illustrate our experience in Montana and are representative of what is happening throughout the nation.

1) The mother of a Crow Indian high school student from Busby Montana, population 452, tells the story. She can't believe how her son has changed. Last year he attended the Minority Apprenticeship Program at MSU and through a partnership with IBM received a laptop computer with a modem. Since that time he no longer hangs out at the local gas station until midnight. Instead, he comes home after school and spends hours online sending and receiving messages from scientists at MSU!

2) Cody Tibbits from Terry, Montana, population 627, currently surrounded by FBI and Freemen, attended the Young Scholars program at MSU and continued to interact online with faculty and students across the state for three years. He had never been out of Terry before that experience and is now a freshman at Harvard because, as he describes it, "the world suddenly became a much bigger place."

3) David Heuck ranches near Miles City, Montana, 288 miles from the MSU campus. Using his computer and modem, supplemented by interactive video sessions, David took classes in Water Quality and got his questions answered by specialists without having to leave the ranch and the work that keeps him there. The course gave him insights into his own water practices and as a result, he has changed his farming practices to the advantage of water quality on the Yellowstone river, which runs past his farm.

4) A single mother and high school science teacher in Canada taking on-line courses from MSU writes to the professor late one night, "This is a dream come true for me. Its 40 degrees below zero, my children are asleep, and I'm able to "go to" class and may some day be able to fulfill my goal of having a masters degree. Without this distance learning option this would never be possible."

Four key issues summarize the needs of Montanans and others in rural areas in order to take advantage of these new opportunities.

1) Access - local dial-up connections at greater bandwidth.

Access to technical infrastructure is an issue in Montana. Internet access is available mostly in Montana's larger communities. When commercial Internet providers extend services to rural Montana, they do so only at the slowest baud rates. Many commercial telecommunications entities do not consider Montana a priority because the market size is just not large enough to realize a profit. Montanans would benefit if incentives for commercial entities to provide access were put into place.

2) Interoperability

Montanans need data, voice, and video equipment and systems that can operate and communicate with one another as well as the administrative infrastructure that would allow for shared communication.

3) Programs that meet their needs

Montanans need access to resources that help them do their jobs, improve professionally and add value to their daily lives. It's all too easy to get caught up and distracted in "gee whiz" technology and wind up with more gadgets that look good but that really aren't valuable. Montanans want the expertise to help them use resources.

4) Technical support to avoid mistakes

Investing in technology is complicated and can be overwhelming. Unfortunately, in rural areas, many short-term and proprietary solutions have been proposed and Communities simply don't have the expertise or access to experts to help sort out all the issues. Montanans need unbiased technical support provided by people who have a long-term, sustainable, and broad-based vision of the future.

Netscape: Montana State University-Bozeman
Back
Forward
Home
Reload
Images
Open
Print
Find
Stop
Location: http://www.montana.edu/
What's New?
What's Cool?
Handbook
Net Search
Net Directory
Newsgroups
Montana State University Bozeman
BOZEMAN

MSU-Bozeman develops virtual university

by Carol Schmidt

A new campus is emerging at Montana State University.

It is not a campus built of stone, concrete or brick. Although the University's physical profile is changing with the construction of the Engineering/Physical Sciences Building, the opening of a new community of married student town homes and the remolding of the campus' Centennial Mall, there is another university rising up along the fragile strands of electronic impulses. It is the virtual university, and its recent development at MSU has been explosive and exciting.

What is "Virtual MSU?"

Within a matter of months, it seems, technology has changed some of our language and way of doing many things. Roadside billboards ask passersby to "come visit us on the World Wide Web." People talk about "Surfing the Net." Educators discuss building a regional virtual university.

So, what exactly is a virtual university? And how can it benefit MSU, its alumni and the community of Montana?

Webster defines virtual as "being so in essence, not in actual fact or name."

For those of us at MSU, the virtual university means using new technology to go beyond the walls of the MSU campus to extend our programs and resources to the people in the state," says Kim Obbink, MSU's director of distance learning and instructional telecommunications.

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Oakley Winters, MSU Dean of Outreach, believes that new technology has helped MSU become a "virtual land grant university," or a university that is now able to serve many Montanans without them leaving their homes.

What are some of those technologies?

Courses broadcast over satellite television and interactive video are two developing technologies that MSU uses when it is practical.

"However, at MSU, we're betting the easiest and most economical way (to reach people who live at significant distances from the university) is through a modem and personal computer. That's our cornerstone tool," Winters said.

An MSU student finds information on the Libraries' electronic card catalog

Islands of excellence

Using those developing technologies, MSU has tailored several electronic programs to the needs of Montanans. In the process, Winters said, the university has achieved national recognition for providing electronic islands of excellence.

One of the most dramatic examples of MSU electronic innovation is the Virtual Medical Center (VMC). Initiated in 1988 by Robert Flaherty, M.D., the computerized bulletin board provides a support system for medical professionals. The center is ideal for those located in isolated areas. For example, a nurse practitioner on a remote Indian reservation was able to diagnose a rare spider bite once she posted her patient's unusual symptoms on the electronic bulletin board. Requests for assistance have come from as far as Mongolia. Last spring VMC professionals helped diagnose a Chinese student's illness after they received an SOS circulated through the Internet. Flaherty now travels throughout the world telling others about MSU's VMC program.

Library without walls

Another integral component in virtual MSU is the MSU-Bozeman Library.

"I know of no other library doing as much as ours in offering on-line computer services," Winters said. "It is truly and rapidly becoming a 'library without walls.'"

The MSU library has become recognized nationally for its efforts to make its resources available to libraries on Indian reservations in the state.

And while traditional card catalog cabinets still line the walls in MSU's Renne Library, students now routinely opt for the library's new bank of computerized card catalogs. The electronic reference system is available to anyone with a personal computer and modem. Anyone with those tools may "dial-up" the library and through a series of simple commands be linked to information networks throughout the globe.

Through the MSU Libraries' Home Page, Montanans can access specifications for bidding goods and services needed by the U.S. government without leaving their computer screen. They can also borrow a book from a library in another state, check out foreign trade indexes, and even review a local ordinance or read "The Congressional Record." Most of the services are free. For more information, call the library at (406) 994-2721. If you have a web browser, you may also access the page at http://www.lib.montana.edu

Courses by computer

Montanans who are unable to attend campus classes, but would like to pursue a college education, may do so through a variety of telecomputing courses offered by MSU Extended Studies. The courses range from a survey of World War II history to advanced physics. In addition to classes taught on computer, several career enrichment sessions are also available on interactive video. The medium of interactive video allows communications between teachers and students in different locations using two-way video and audio transmissions, or connections.

Some of the distance degree programs available from MSU include masters degrees in civil engineering, technology education and computer science. Graduate courses are also taught in adult and

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high education, curriculum and instruction, science and science education. The College of Nursing is offering a good portion of its Rural Nurse Practitioner program on interactive video.

George Tuthill, MSU physics professor who has taught several classes "on-line," says the medium does affect the teaching/learning process. Students tend to be more careful and thoughtful about their on-line responses. While there is some good networking, the spontaneous discussions of the campus can be lost, he said.

Tuthill doesn't believe the virtual classroom will ever replace the traditional campus, as some fear. For one thing, the virtual university isn't as economically efficient as a traditional campus, Tuthill points out.

"But it does have some strengths for teaching," Tuthill said. "The student can think very deeply about a topic. At the same time they aren't just taking a test (and storing that information until they need it.) They are out there using it the next day."

For more information on computerized classes offered through MSU, contact the Burns Telecommunications Center, (406) 994-6550.

Burns Center is cornerstone

Perhaps the most tangible symbol of the MSU's virtual university is the Burns Telecommunications Center, located in the new Engineering/Physical Sciences Building and due to be occupied in late 1996. The MSU Foundation is raising $7.5 million in donations to build and equip the Burns Center, which will include an instructional laboratory and classrooms and facilities to send and receive interactive video, satellite up- and down-linking, public television as well as Internet conferencing. More than $1.2 million is in hand.

Curriculum is already being developed. Last summer the Burns Center funded seven faculty summer scholarships which included a $4,000 stipend, a laptop computer and $1,000 for materials and expenses. For example Joel Jahnke, director of Shakespeare in the Parks and a professor of theatre arts, is developing a "Shakespeare Online" course and architecture professor Tom Wood created an Internet course in lighting design for architects, engineers and builders. This summer the Center hopes to fund 15 additional faculty members, Winters said.

Find us on the Web

MSU-Bozeman has put up a home page on the World Wide Web. To learn more about MSU and its programs, find MSU's web page at: http://www.montana.edu. In the first few months the page was on the web, it had more than 90,000 "hits," or looks. From the MSU home page, you can link to web pages designed by MSU departments or related organizations. For example, KUSM, Communications Services, the College of Letters and Science and the Department of Animal and Range Science all have their own innovative web pages. In fact, there are several thousand pages of documents linked through MSU.

How do I get started?

Obbink said she encounters some fear of new technologies, but not as much as one might expect. One reason may be that Montanans are a little more computer literate than the rest of the nation. Obbink said statistics show 33 percent of U.S. households have a personal computer, but "there is some indication Montana is a little over that."

"Fear of using the system is probably one of the easier fears to overcome," she said. "People are becoming more and more comfortable with new technologies. Especially when they find they can get these things without leaving home, quitting their job, or even hiring a babysitter and finding a parking place."

All of the MSU programs discussed in this article have on-line or phone help available to guide users through access problems. The phone numbers listed in the article are a good place to start. Access to a personal computer, modem and phone line is necessary to link to the virtual university.

Obbink doesn't think Virtual MSU will ever replace Traditional MSU, but she does think it is a nice supplement — particularly for graduates.

"There is an emphasis on the concept of life-long learning with the 'virtual university.'. Universities will no longer exist solely to provide people with a time-specific degree. Through the virtual university, ongoing education will always be available."

Carol Schmidt is the editor of "The Collegian."

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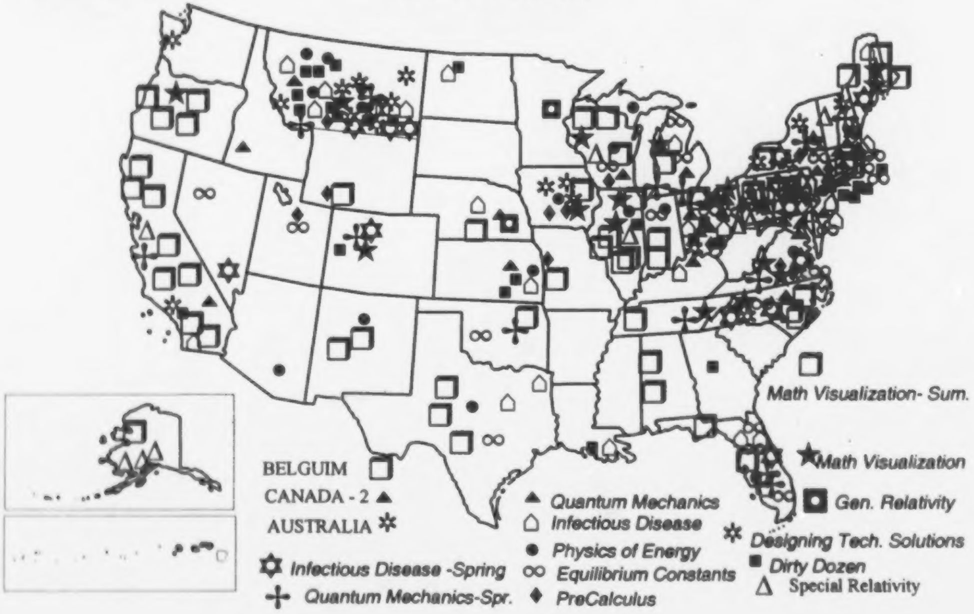
The National Teachers Enhancement Network

The National Teachers Enhancement Network at Montana State University-Bozeman provides secondary science teachers with quality courses to enhance their knowledge and teaching skills. Courses are developed by active research scientists and mathematicians, and practicing educators. Course participants establish working relationships with science faculty and peers on a national level. NTEN was established by a grant from The National Science Foundation. Following is a map that shows locations of course participants for 1995-1996.

NATIONAL TEACHERS' ENHANCEMENT NETWORK

1995-1996 Courses


Math Visualization- Sum.
★ Math Visualization
BELGUIM
CANADA - 2 ▲
AUSTRALIA ✲
▲ Quantum Mechanics
△ Infectious Disease
● Physics of Energy
∞ Equilibrium Constants
◆ PreCalculus
✡ Infectious Disease -Spring
+ Quantum Mechanics-Spr.
▣ Gen. Relativity
✲ Designing Tech. Solutions
■ Dirty Dozen
△ Special Relativity

BURNS TELECOMMUNICATIONS CENTER

Outreach Connection

MONTANA STATE UNIVERSITY-BOZEMAN MARCH 1996

Erasing Boundaries With Technology

Photo: Cindy Bridgewater

The new Engineering/Physical Sciences building, home of the Burns Telecommunications Center

Welcome to MSU's OUTREACH CONNECTION ! The purpose of this publication is to inform you of the Burns Telecommunications Center's efforts to expand educational opportunities for individuals and communities using affordable technologies. Telecommunications will allow MSU to increase its commitment to lifelong learning and help businesses, professional associations and public agencies to meet their training and information needs.

The Center is named in honor of U.S. Senator Conrad Burns, a leading advocate for using telecommunications to keep rural communities vital. Senator Burns is the chairman for the campaign to equip, furnish and endow a state-of-the-art outreach telecommunications facility on the Bozeman campus. This facility will enable MSU to aggregate its multimedia resources, provide training and outreach services using the latest technologies, and research effective distance learning strategies. The Center will open in January 1997.

The Center has two purposes. The first is to extend educational programs and services into the homes and work places of people who need them, wherever they may be. A second purpose is to improve teaching across great distances and to share what we learn with schools, colleges and other organizations, private as well as public.

I invite your involvement in this important project.

Oakley Winters
Dean for Outreach
Campaign Director

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2 Partnership Connection
3 Donor Connection
4 Campaign Connection

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Student-Centered Learning

With all the talk about resources on a national information network, very little specifically addresses how the electronic medium will change the way people learn. Most funds are currently directed toward building a technical infrastructure and providing universal access. Equally important is the ability to understand how this new infrastructure will change the way we do business in education. The power of new electronic connections creates virtual communities independent of time and location. It is now possible to provide distance students with peer and mentoring support, powerful and engaging simulations, and the near infinite resources of the Internet in ways never before available. Unfortunately, much of the recent distance learning rage does not take advantage of this potential. In many places the emphasis is on replicating the traditional classroom (including the elements that don't work) and broadcasting it over the airwaves. Another trend is to deliver Internet courses by replicating the traditional correspondence course (and all of its limitations) with the addition of an e-mail address.

Montana is a unique laboratory for distance learning. In addition, MSU has faculty who are experimenting with new technologies in ways that go beyond current popular practices. By using the personal computer and modem as primary tools for teaching, the focus shifts to the learner and the content. The power of telecomputing as a personal communication tool is well established; recognizing the power of this medium as a unique educational tool that goes far beyond independent study and information transfer is just beginning.

MSU-Bozeman faculty have delivered telecomputing credit courses to over 500 students nationally. A variety of creative non-credit programs are also available on-line. MSU electronic library services provided to distance students are considered a model for programs around the country. Data collected from these on-line activities raise many interesting issues:

1) Using the on-line medium creates a learner centered environment in which both student and instructor are able to maintain flexible schedules, work from convenient locations, and maximize interaction.

2) Especially interesting is the evidence that students appear to engage in a great deal of peer and collaborative learning, perhaps more than occurs in a traditional classroom.

3) Participants and instructors feel that the electronic delivery actually enhances interactions. The delivery mechanism addresses access and equity issues and provides students with a level playing field for participation. Increased one-on-one interaction between student and instructor is also evident.

These are only a few of the challenging issues. Several instructors have commented that the on-line teaching experience has changed the way they think about teaching and learning, even in a traditional classroom. It is an exciting time to be involved with distance learning at MSU as we continue to establish ourselves as leaders in exploring and defining the learning communities of the future.

Kim Obbink
Director of Distance Learning

Partnership Connection

New opportunities have emerged recently for the University to leverage its resources through partnerships with a variety of organizations. Through these we hope to establish working relationships that are productive for all concerned. Here is an example of a current Center partnership:

Photo: Linda Best
Northern Cheyenne student Dion Tang

IBM is providing the Center with reconditioned laptop computers at deep discounts in return for research on how they might be used most effectively for distance learning. More than 250 reconditioned laptop computers have been distributed so far among a variety of distant users of the Center, including Native American students enrolled in MSU's Minority Apprenticeship Program. This summer program brings bright high school students from Montana's seven reservations to the Bozeman campus for six weeks of classes and hands-on work in research laboratories. In an effort to overcome a sense of isolation when they return home, participants are provided "Thinkpads" and network access to keep in touch electronically with each other and with the scientists with whom they worked during the summer. The program encourages participants to consider careers in science through their interaction with research scientists.

This partnership has helped the Center to provide some of its constituents with inexpensive access to its on-line services and IBM with data it needs to create a marketing strategy for its reconditioned equipment.

Partnerships are critical to the Center's success. If you or your business, agency or association have training, research or information needs, please contact us. Our phone number is (406) 994-6647 or fax us at (406) 994-1756.

The Burns Telecommunications Center.

Your name ____________________
Address ____________________
____
____________________ Zip ________
Phone (H) ____________________ (O) ________
Name(s) in which gift or pledge should be recorded ________
____
Total amount of gift or pledge ____________________
Amount of pledge increments ____________________
Pledge payment start date ________ End date ________
Please send reminders ____monthly, ____quarterly, ____semi-annually, ____annually

Designation of funds
____ Equipment and Facilities ____ Training
____ Research and Development ____ General Support
Please send additional information on planned giving ________
Please send additional information on naming opportunities ____
May we include your name ____ amount ____ in campaign publications?
Signature ____________________

Please make checks payable to the MSU Foundation and mail this form to: MSU Foundation , Burns Telecommunications Center, Montana State University, Bozeman, MT 59717 406-994-2053

The MSU Foundation is a not-for-profit 501(c)(3) organization benefiting Montana State University-Bozeman.

Campaign Connection

When the new building in which the Burns Center is prominently located was approved, the Legislature authorized the expenditure of a combination of public and private funds for its construction but nothing for furnishings and equipment. Consequently, the first priority for our private fundraising campaign is to equip and furnish the Center facility which is due to be completed in January 1997.

Our target for the facilities portion of the campaign is $1,750,000. As of February 1, 1996, we have raised $729,000 or 41%.

Other targeted campaign components include:

- $1,000,000 to establish a fund for the continued maintenance and replacement of state-of-the-art equipment;
- $1,500,000 to create an endowment to provide an ongoing source of funds for the training of faculty, students and other users to employ distance learning technologies effectively;
- $2,000,000 to create an endowment to foster the research and development essential to the establishment of new programs and services and the continuing testing and evaluation of new learning strategies.

The overall Burns Center campaign goal is $7,200,000, of which $1,565,453 has been awarded or pledged. You can participate by:

- Becoming familiar with the Center and its activities and helping to publicize them;
- Helping us to identify learning needs, service opportunities and potential partnerships within your community;
- Donating to the campaign to equip, furnish and endow the Center; and
- Volunteering your time and expertise to guide and grow the campaign.

MONTANA
BOZEMAN

Burns Telecommunications Center
Outreach & Extension
204 Culbertson Hall
Montana State University
Bozeman, MT 59717

NON-PROFIT Org.
U.S. POSTAGE
PAID
Permit No. 69
Bozeman, MT 59715

Senator **Burns**. Thank you, Kim. Those points are well taken.

Our next witness is Dr. Janet Lewis, Dean of Continuing Education, University of South Dakota, Vermillion, SD, and thank you for coming.

STATEMENT OF JANET K. LEWIS, Ph.D, DEAN OF CONTINUING EDUCATION, UNIVERSITY OF SOUTH DAKOTA, VERMILLION, SD

Dr. **Lewis**. Thank you for having me here. Elyne Lande, an administrative assistant in Pierre, which is South Dakota's capital, she travels frequently, and because she is out of town a lot, cannot be there to take classes in Pierre.

Viola Lyons is a copartner in the family ranch, and is interested in taking course work on helping her run those family finances, yet she is place-bound hundreds of miles away from any university.

Kelli Heidler and Chandelle Vig are from Faith. They need to take an advanced math course so, as Senator Rockefeller, mentioned, they can play on an even playing field when they get to college, where students from larger populations have the advantage of those more advanced math courses in their high schools.

Monica Riese is a seventh grader. She wanted to take Spanish before she went on a trip with her parents down to Argentina.

Jim is an Air Force serviceman at Ellsworth Air Force Base. He is going to be gone on training onsite this semester, so he cannot take the courses that we are delivering real time at Ellsworth Air Force Base, and he will not be able to finish his program of studies because he is going to be transferred soon.

Larry, who is a very, very bright handicapped student, finds that distance learning is a better way to deal with his transportation difficulties, and that distance learning provides him more adaptability through computer-assisted changes that he can make, than what he can actually get in a traditional classroom setting.

All of those people are and need to continue to learn through a variety of different distance methods.

You can look at a lot of different occupations, but I would like to just take one, health care. Health care in South Dakota is a real issue for us, traveling over miles and miles. We use an ISDN line that is dedicated. I think you are going to see an example, as I understand, Senator Pressler, of our picturetel system which we use in our medical school to train our faculty and to assist with diagnoses across the State. Health care has distance learning needs, and the list goes on.

The need to expand our distance learning opportunities is not unique to South Dakota. It reflects the national averages and the national statistics, where enrollment of students 40 years and older has more than doubled since 1970. The vast majority of these students are part-time students, and part-time students are the fastest-growing population in higher ed, with one-third of all undergraduates and two-thirds of all graduates being part time.

As you mentioned, Senator Burns, individuals change jobs as many as seven times before retirement, and so we need to provide distance learning opportunity to help them retool and keep abreast of the changing technologies and the changing environment. Both individual examples and statistical analysis make it obvious that the majority of our citizens are, in fact, underserved and greatly disadvantaged by our over-reliance on a traditional educational format. Distance education via technology can provide that education, and it is sorely needed if we are to meet the needs of our citizenry and support the principles of a democratic government based on an educated and informed population.

We have many success stories, as with Kim, in South Dakota. Distance learning is a combination of using a lot of technologies and a lot of different delivery mechanisms. In South Dakota we use such things as instructional television, satellite systems to drop into 70 high schools across the State, with programming both for high school, economic development, and graduate and undergraduate degrees. We use microwave cable television, interactive fiber optic networks, and interactive ISDN technology.

All of these different technologies often need computers. They need software, they need Internet to provide that interaction, and they use things like CD ROM and the like. Virtually every home has access to some kind of instructional technology. Fifty-seven percent of homes have cable television. One-sixth of the adult population owns or has access at work to a computer. It is projected that the Internet users are expected to number nearly 20 million by 1997. The sheer volume of information alone will require new skills in navigating or "surfing the net," which is just one of those emerging technologies.

Therefore, while the need for distance education is well established, the technologies and infrastructure to adequately respond to that need is only in its infancy. Hence, at least four avenues of recommendations are here to be provided. I would like to suggest four things I think that you need to consider.

First, we need increased institutional and individual support. We need to support more actively existing K–12, higher ed, and technical education, and their endeavors.

Presently only 10 percent of the K–12 schools in South Dakota have that local Internet access that you mentioned, which would be at a cost-affordable rate for them. If it is long distance, neither these individual students nor a K–12 institution can afford access. That access structure is not currently there. We need to increase support, both financially and through policy, to provide those opportunities.

Individual support is also needed for grants for students that are less than part time. The majority of these distance learners are not taking 6 hours or more. We also need to examine and expand the guidelines which could allow for mastery and competency-based learning compared to those traditional contexts.

It is essential that this support be forthcoming, because as it was mentioned, if we do not provide a cost-effective access on the individual and the institutional level, we will have that split between the "have's" and "have not's," which in today's definition is have and have not access to technology.

We need to support an infrastructure development that will allow interstate connectivity. We have the RDTN, Rural Development Telecommunications Network, but it cannot talk to the Iowa Communication Network at affordable rates because those are not directly connected. We must establish, just like we did in the

1950's and 1960's, the Interstate Highway System, a technological infrastructure with interstate connectivity.

We need to support innovative and emerging systems, and these systems have to be new, with new partnerships, new linkages, new ways of mixing the content of education with the context delivery mechanism of education. No one delivery system is the right answer in all contexts, so we have to provide a variety of those, and we need to continue to support the tried and true, the proven. South Dakota Public Television serves a lot of people in our State. Nationally, millions of students have taken public television courses in the past. Last year alone we had 790 students in South Dakota take Public Television courses in our State. So we need to combine support for the new and the innovative, and allow those structures, while continuing support for the tried and true.

The new paradigm is here, which is no longer a "sage on the stage," but rather education is about being a "guide at the side" through the new technological systems. I urge your support for those systems. The shelf-life of solutions is getting shorter, and what works today becomes history in a hurry. Therefore, above all I urge the committee to be aggressive in providing resources and opening up opportunities through policy reexamination and creation to foster flexibility in the delivery usage of technology and institutional delivery linkages. I, Elyne, Heidi, Jim, Larry, and the thousands and millions out there that need this access thank you.

[The prepared statement of Dr. Lewis follows:]

PREPARED STATEMENT OF DR. JANET K. LEWIS, DEAN OF CONTINUING EDUCATION, UNIVERSITY OF SOUTH DAKOTA

DISTANCE LEARNING NEEDS

Elyne Lande, an administrative assistant in Pierre, South Dakota's capital, wishes to earn a graduate degree to help her more effectively complete her current duties and provide her additional avenues for professional and financial development. Viola Lyons, a co-partner on the family ranch outside of Newell, South Dakota, wants to earn an undergraduate degree to better run ranch finances and expand her career options. Kelli Heidler and Chandelle Vig, high school students in Faith, South Dakota, would like the opportunity to learn advanced math not available at their local school to enable them to compete at the college level more effectively with those who have access to such courses from larger, more populated areas. And, Monica Riess, a seventh grader, wants to learn Spanish before accompanying her parents on their trip to Argentine; no foreign language is now available to her at her middle school.

These personal examples of the need for expanded distance learning opportunities are not unique to South Dakota. They reflect the national statistics:

- Since 1991, almost 60 percent of all college students were 22 years of age or older (National Center for Education Statistics, [NCES], 1992).
- Between 1970 and 1991, the annual enrollment of students 40 and older in all sectors of education more than doubled, with undergraduate programs having the largest enrollments, (National Center for Education Statistics [NCES], 1995).
- Approximately 49 percent of all students 40 and older attend 2-year public institutions, and the vast majority of these students attend school on a part-time basis (The Institute for Higher Education Policy).
- An individual will change jobs as many as seven times before retirement, yet few students can afford to return to education full-time to meet those changing job skill needs (National University Continuing Education Association [NUCEA], 1995).
- Part-time students are the fastest growing population in higher education, with one third of all undergraduates and two thirds of all graduate students being part-time (National University Continuing Education Association [NUCEA], p. 3).

Statistics and personal examples alike show us, these students of which many are part-time, need access to education where they live and work.

Distance education needs exist in particular fields. Selecting only one, an examination of distance learning needs in providing for our nation's health care reveals:

- Doctors in Rapid City need to confer with specialists in Sioux Falls, across the State, for diagnosis and discussion for care of patients,
- Nurses in Viborg need training on updated procedures, and
- Physical therapists need access to continuing education to maintain certification and up-to-date knowledge.

Obviously, distance learning experiences are necessary to maintain adequate rural health delivery and care, as well as providing necessary sharing of recent developments in health care even in urban areas.

Distance learning and its attendant technologies also has the potential to better provide educational learning for various specific populations:

- Most notably may be handicapped or specifically challenged populations where an enhanced quality learning environment may be created in the home, via adaptive technologies such as color and large print screens on computers which may enable individuals to learn and process or communicate more effectively through mediums typically restricted in traditional classroom settings.
- Placebound rural populations miles from any specific facility, both for K–12 and higher education or technical education opportunities, could participate though technology.
- Working individuals restricted from educational access during traditional learning times could also benefit.
- Working professionals that are required to travel to fulfill job requirements or military personnel who leave one location for specific periodic onsite training or will not be stationed in one place long enough to get an entire program of study complete;
- And the list goes on.

Both by individual example and statistical analysis, it is obvious that a majority of our citizens are underserved and greatly disadvantaged by the sole use of traditional educational formats. Distance education via technology can provide that education and is sorely needed if we are to meet the needs of our citizenry and support the principles of a democratic government based on an educated and informed population.

DISTANCE EDUCATION TECHNOLOGY

"Distance education is an umbrella term used to describe a process of educating or training participants who are separated from an instructor or trainer by space and/or time, when knowledge or skill deficiency has been determined and specific educational goals and objectives have been identified" (Moller & Jedzerjek, 1993). Several technologies have been used, but even more are on the horizon.

Distance learning programs can and perhaps should use a mix of technologies such as instructional television, satellite, microwave, cable, telephone, interactive fiber optic networks, and dial up interactive systems using ISDN technology, i.e. PictureTel.

Asyncronous learning or distributed education incorporates the positive aspects of distance education while eliminating place and time constraints. Distributed methodologies enable courses to be taught through virtual interaction and collaboration. Distributed methods incorporate computer technology and software (such as Lotus Notes) to the Internet provides interaction between group members around the world, both in real or delayed time.

These developing technologies include such delivery mechanisms as: Desktop computer mediated software for videoconferencing (i.e., CUSeeMe, Vid Call, Intel's ProShare, and IBM's Person to Person). These give you the convenience of real-time, interactive collaborative communications from the home or office desk. Most of these software packages have a system requirement of at least a 486 PC with eight megabytes of memory, a standard telephone line, and access to the Internet. At the same time, CMI can incorporate peripheral multi-media technologies such as: video tape, slides, document camera, graphics, presentation software, CD ROM and the like.

Virtually every American home has access to some kind of instructional technology: 57 percent of homes have cable television and one sixth of the adult population owns or has access at work to a computer (NUCEA, 1994, p. 10). However, access to the delivery mechanism needed and the finances to support the ensuing costs may not be available; nor may the individual have the skill to access the needed instructional technology nor the knowledge of where, how & when to access the particular educational or training information needed. Therefore, this committee needs to consider not only the current and future distance learning needs and technology to meet those needs, but policy decisions to meet those needs and support existing and future developmental distance education processes.

RECOMMENDATIONS FOR DISTANCE LEARNING DEVELOPMENT

While the need for distance education is well established, the technologies and infrastructure to adequately respond to that need is only in its infancy. Therefore, at least four avenues of recommendations are provided for consideration by this committee.

1. Increased Institutional and Individual Support

We need to support more actively existing K–12, higher education, and technical education at both the institutional and individual levels, as well as add support to emerging multi-institutional endeavors.

This means heightened financial support for educational institutions through typical general support, and more. Examination of the national index of public effort to fund education based on revenues per student in relation to per capita personal income reveals that support for higher education has overall decreased since 1966, while elementary/secondary support has only slightly increased (NCES, 1995).

Also greater support is needed through such activities as grant opportunities to both acquire technology and support delivery through technology, as in: the purchase of high speed computers with internet capabilities and their attendant necessary software, training of faculties to retool for these technologies and redesign curriculum to incorporate them, and to support delivery via these technologies such as support for development and delivery of local internet access. Presently, only 10 percent of the K–12 schools in South Dakota have local internet access.

Individual support needed includes increased availability and access to educational grants and scholarships, especially to include purchase of technological equipment for home use as well as making grant and loan moneys available to students with less than half-time course loads (or less that 6 hours of work per semester). Also, reexamination and expansion of guidelines which could allow for mastery or competency-based learning compared to traditional learning contexts should occur.

Keeping costs down by augmenting technological delivery at this point in development is essential. Institutions do not have the resources for the upfront and continuing hardware/software capital asset costs, nor do individual students. Further, delivery cost support is essential. Exclusion of this support may lead to the new "have/have not split" which is today and in the future going to be based on if people "have or have not" technology.

Further, support for corporate development of these technologies and continuous delivery costs is important. Without them, the costly development stage may preclude entrepreneurial yet smaller businesses from developing in this area.

2. Support for Technological Infrastructure Development

Governmental financial and policy support for the development of our technological infrastructure(s) is essential. Just as we needed support and planning during the 1950's and 1960's to create an efficient interstate highway system, we need interstate technological connectivity to provide an effective method of educating our population. For example, South Dakota has an interactive telecommunication system called the Rural Development Telecommunication Network (RDTN), and Iowa has the Iowa Communication Network (ICN). Both are excellent methods of providing in-state educational opportunities to specific sites across that State. However, South Dakotans do not have access to educational opportunities available just across our borders at cost effective rates. This is particularly unfortunate in program areas that are not provided at the regential institutions within our State. How much more effective we would be if we could access those out-of-state resources for costs that would allow us to do so. Availability of education would be enhanced through both importing and exporting of courses and entire programs of study to the citizens of those States.

3. Support for Innovative, Emerging Systems

Financial support plus recognition and policy support for alternative and innovative systems of education is recommended. At this point in development, emerging educational entities and collaborative efforts need to be incubated. Therefore, the government needs to foster systems which maintain flexibility and entrepreneurial activities, even in new organizational forms. These include collaborative efforts between business and education, among educational units, and partnerships across content and delivery contexts.

At this fall's Western Governors' Conference, the Western Virtual University was born. Being developed under the Western Interstate Commission of Higher Education within the Western Cooperative for Educational Telecommunications Division, its goals include: (A) expanding access to a broader range of postsecondary education, (B) reducing costs of providing these opportunities through a vehicle for cost sharing, (C) providing learners formal recognition of the skills and knowledge they acquire through advanced technology-based learning, (D) shifting the focus of education to actual competence instead of traditional "seat time", (E) creating high performance standards to improve quality, and (F) demonstrating new approaches to teaching and assessment. This new collaborative structure will create a "meta-university" which serves as a coordinating clearinghouse function of brokering courses and programs to students through franchising those courses and programs through existing educational entities and business partnerships.

Innovative educational activities such as these need recognition and support, as do activities that bridge multiple delivery mechanisms. No one mechanism is adequate nor appropriate for all educational activities. Hence, support for linkages and partnerships which bridge the content/context gap is essential and needs to be fostered.

Additionally we need to continue support for those activities that are tried and been proven effective in distance education. This includes support for the Public Broadcasting System (PBS). Over twenty-eight million students have registered for telecourses through PBS (Gross, Muscarella, & Pirkl, 1994, p. 32). At the University of South Dakota last year alone, 790 students took telecourses, and USD this spring added live broadcasts and interactivity via phone bridges to the South Dakota Public Television delivery mechanism. These included citizens throughout South Dakota, as well as servicemen and former residents currently living internationally but taking courses by video cassette. Hence, existing delivery methods can be mixed with new mechanisms to meet distance educational needs.

In sum, we must encourage innovation while supporting proven educational endeavors.

4. Facilitate the New Educational Paradigm

The new educational paradigm is a cultural shift in how we view the teaching and learning process. No longer is a "sage on the stage" the sole recognized teaching approach to education. Rather, in this information and technological age, a teacher serving as "a guide at the side" for outcome, value added assessment of competency based instruction must be included. Real educational activities much include access to technology and its presuppositions that require skill in technological utilization and processing.

The United States work force is projected to increase by 26 million workers by the year 2005 with particular increase in minorities and women (NUCEA, 1995, p. iii). This will also include attendant increases in lifelong learning, relearning, and retooling. For example by 1997, it is projected that internet users are expected to number nearly 20 million people (NUCEA, 1994, p. 58). The sheer volume of information alone will require new skills in "navigating" or "surfing the net," which is just one of the emerging technologies for education and training.

Students will require flexible learning schedules that are highly individualized, very focused and career-related. Education will need to be more versatile. Distance education will be an important solution to the barriers of cost, location, time and demographics. Education of the future must be:

- Learner centered, not teacher-centered,
- Free of the constraints of time, place,
- Results oriented and largely marketplace driven,
- Application oriented and able to be skill assessed,
- A continuous life-long process, plus
- Tailored to meet the needs of the student and the economic environment of the times. (Purdy, Smith, Connick, & Habura, 1995).

CONCLUSION

What is done in this subcommittee will influence our nation's ability to meet educational demands now and in the future. We are living in a constant and ever accelerating period of transition. The shelf life of our solutions keeps getting shorter. "What works" becomes history in a hurry. Therefore, above all, I urge this committee to be aggressive in providing financial resources and in opening opportunity through policy reexamination and creation to foster flexibility in the development of technologies and institutional delivery to educate our citizens.

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Senator BURNS. Thank you, Dr. Lewis. I think you hit the nail on the head. You know, we have got to move ahead. People are displaced and lose their jobs because the world moves on, not anybody's fault or any thing's fault. We just do not make buggy whips anymore. So we must move on. Thank you very much.

Dr. Henry Marockie, from Charleston, WV, thank you for coming. We appreciate it. We will hear from you now.

By the way, I want to introduce the chairman of the full committee, Senator Larry Pressler, who has just joined us, and Senator Exon. Senator Exon has chosen not to join us in the next session, and is going to retire and go back to Nebraska. I cannot figure out why. They are just learning to play football there in Lincoln. [Laughter.]

Senator BURNS. Dr. Manockie, we will hear from you now.

STATEMENT OF HENRY MAROCKIE, Ph.D., WEST VIRGINIA STATE SUPERINTENDENT OF SCHOOLS, CHARLESTON, WV; ACCOMPANIED BY JESSICA LAMBERT

Dr. MAROCKIE. Senator Burns, Chairman Rockefeller, and members of the committee, it is a delight to be here, and we have heard some dynamic presentations. But let me switch gears, if I may, before I testify, and ask our student, Jessica Lambert, to present to you some dynamic information about what it is really like from a student's standpoint on top of a mountain in West Virginia, receiving the benefits of this dynamic technology from the student's standpoint.

Ms. LAMBERT. (Speaks in Japanese.) Translated, I just said good morning, my name is Jessica Lambert. I go to McDowell County, WV, Mountain View High School. I am pleased to meet everyone. That is just one example of the many things I learned in first-year Japanese. Japanese II goes more in depth, with language usage and culture interactions, and Japanese is definitely an experience

I am very proud to say I have taken, because I feel it will be beneficial to my future career in journalism.

I do not want to end this short statement without thanking all of those representing West Virginia and its educational systems for the many doors they have opened to me. Without these satellite classes and those open doors I would be left in the dark from a lot of opportunities, because I live in a very depressed and rural area of America that would probably otherwise not be able to obtain a personal foreign language teacher and such a wide variety of languages such as are available through satellite classes.

So once again, thank you all. You, by allowing these privileges, are carving paths for the students of today to become successful leaders of tomorrow. You can, and hopefully will, proudly tell the world where they came from, how they got there, where they are going, and who helped, through education, clear the path to all of their successful lives. I hope satellite classes become more widespread and will continue to improve the views of many about education, the view that education is not an obligation, but a privilege. Now, in closing with a Japanese farewell, (speaks in Japanese.)

Dr. **MAROCKIE**. Jessica, maybe for the benefit of Senator Rockefeller, why do you not use the introduction again? Let us have Senator Rockefeller hear the full text of your orientation.

Ms. **LAMBERT**. (Speaks in Japanese.)

Dr. **MAROCKIE**. In your expertise of Japanese, that is not too bad, is it, Senator?

Senator **ROCKEFELLER**. No, that is very sophisticated, because she used the word watashi, which is I, and what that does is recognizes her student level. In other words, I would say watakushi, with a k-u, watakushi, because I am older than she is. So when she talks to me or to this panel, since we are older than she, she uses watashi, which is a more humble thing. So she is really learning.

Dr. **MAROCKIE**. So from Kim's standpoint and from Janet's standpoint, the real world does exist.

With regard to that, may I just for a few moments take the opportunity to transmit some information to this committee from the standpoint of the school system, a whole State school system in West Virginia that is trying to engage in an ambiance of technology throughout the State, but particularly in the area of distance learning? One of the areas that we find especially attractive about the area of distance learning is not only does it provide, as you heard here from Jessica, the equity, the opportunity, but more importantly than that, to us it provides the equity of instruction. So that, to us, is critical from the standpoint of distance learning in terms of its quality.

In addition to that, we have got about 900 students across the State of West Virginia, from K–4 on up, availing themselves of the distance learning concept. All the way from kindergarten through the fourth grade where they do enrichment activities, through advanced placement classes to go to college and get graduate credit from them.

In terms of staff development, it is all over the State of West Virginia from the standpoint of remedial activity, from enrichment activity, from teen teaching activity, and from educational meetings that we no longer now have to bring a group to Charleston and, as you know Senator, in Charleston sometimes people would rather stay in their home communities and have meetings than travel to Charleston, but more importantly to be able to have those across the State.

But the growth of this throughout the State in a few years has been enormous. Not only now do we have Japanese I and II, we have Spanish I, II, and III, we have German, Russian, Latin, physics, precalculus, marine science, astronomy, and psychology. Those are available to mostly secondary students all across the State of West Virginia. Let me reemphasize again, the critical importance of that is the equity of the instruction component, not necessarily just the opportunity to take those classes. It is rare that we could find in a small State like West Virginia people with the talent and skills to offer those in all of our high schools, but it is not impossible to find one person somewhere with the talent and skills to offer each one of those throughout the State.

Through the course of that we began some of this with the Star Schools, and I think some of you are remembering of the Star Schools initiative where we were one of the original school systems to receive a grant. That has led to a rather sophisticated system, and distance learning now in West Virginia is taking on a variety of models, doing a lot of different things, so let me share very quickly with you just a few.

Public Television, that access alone over the course of the past 20 years is now reaching about one-third of the student population in West Virginia. We have 310,000. Our best estimates are about 100,000 to 125,000 students have been availing themselves of that initiative in the State. The telecommunications system is a two-way interactive system that allows us unique opportunities to go across the State live, in directive across the State, with various things other than just the classroom.

For example, we have a technique that we have incorporated into the elementary schools called teach-reteach. It is an avenue to get to this ever-ever-present issue of how much time do students spend on learning. We have learned very clearly that in the basic skills you need to spend more time in order to learn that for some students. What we have been able to do with this medium is provide that development for teachers all across the State of West Virginia in order to incorporate that into technology. What distance learning allows us to do is because it is taped, generally, a student who misses the first time can rerun the tape and teach it to themselves again. It is a dynamic technique in the teach-reteach concept.

We have gone to caves, where we have uplinked the experience. So the virtual cave trip has been available to students in classrooms who would never have been able to achieve that objective in the course of their regular school opportunity.

Distance learning through the Internet: In a great partnership with Bell Atlantic, a $10 million project, we are going to install Internet to 85 percent of the schools by December 1996. That is a major objective in the State. We already are ready. Either they are already hooked up or they are ready to be hooked up. Six hundred of the 850 schools are already in the process of that access to the Internet.

As the Senator indicated, in one place in West Virginia we had to knock off the top of a mountain in order to build a school. Let me give you an example of a place equally in the same area, a place called Logan County, WV, where the expectation generally would have been for a Saturday afternoon to leave the community in which the child was to go into the city of Logan. When the Governor and I were down there recently for a hookup of the Internet system, a junior high school student very excitedly took us to Paris, France, identified all the respective buildings, showed us how she related that to a research paper she was writing, and then also showed us the pen pal she had already made contact with in Paris, France. The dynamic of that is incredible. In addition, 8000 E-mail accounts have been placed all through the State of West Virginia.

The reinventing education grant with IBM, an important initiative in the entire State to implement the SCANS, as it relates to harnessing the power of the Internet system in order to bring it into this classroom so that young people can be more skilled when they go into the work force, at the end of that, in order to meet this pressing demand, the one that just came out of the New York summit where corporate America is saying to us we need to know more about the competencies of your graduates and we need to have more graduates with competency, the end of this program is an electronic portfolio that youngsters can accumulate during the course of the year, go to corporate America, and say here are my qualifications for your job, Mr. Corporate America. We think that is going to go a long way in eliminating this misperception that young people are not qualified for corporate America in this country.

The Interagency Group, which is our link, it is made up of a lot of people in the Department of Ed, broadcasting authority, the Department of Administration, the Library Commission, higher ed, and so forth, it is our link and our competition, as Senator Rockefeller indicated, into the best cost for satellite and linking these programs. It is the competitive nature, they are well-versed on the cost structure, they keep us in the ball game in order to get the best prices for purchasing air time in these areas.

Let me say a word about the future of this State. The legislature this past year passed a bill called Senate bill 300. Its title is jobs through education. It is a dynamic piece of legislation, probably the most far reaching in the State's history in terms of institutionalizing the goals for public education in the next 10 years.

What that says to us is youngsters will move through the system in a different way and be prepared either for the job market or for college. It establishes four major standards, one for elementary students, one for high school students, one for the marketplace, and one for adults. It very clearly says that. By doing that, and by setting that into the structure, it is now going to allow us to more efficiently spend our money in what kinds of technology we are going to need in order to deliver those kinds of programs to our young people.

It builds upon a basic skills computer program that now is through every classroom in West Virginia, kindergarten through the fifth grade. Every classroom in West Virginia has a well-trained teacher in that area, with four computers in the classroom.

The legislature in this bill funded the money to finish the sixth grade and start the basic skills program into the middle schools and into the junior high.

It has made an enormous difference on how teachers teach. It has made an enormous difference on how students will learn the basic skills of reading, writing, mathematics, and then become computer literate. What it has in essence done is created a great expectation across the entire State of West Virginia not only for students but equally for parents, who now expect the State to deliver the technology in the classroom so their youngsters can have them as they move up.

One hundred and seventeen thousand five hundred (117,500) computers have been places; 12,000 educators have been trained for those classrooms in all of the 55 counties across the State. Distance learning is linking into that because we are taking the best of the practices we find and linking it out across the State in order to train and be prepared for all of the teachers.

Senator BURNS. Doctor, can you wrap up? We are going to lose satellite time at 11.

Dr. MAROCKIE. Let me do one final thing.

Senator BURNS. Well, do it quick. [Laughter.]

Dr. MAROCKIE. Leaders say technology for learning is important and impossible. That is what we think is the key to the future, people like you, people like Senator Rockefeller, people like your committee saying that it is important for learning in this country, will make this thing happen.

[The prepared statements of Dr. Marockie and Ms. Lambert follow:]

PREPARED STATEMENT OF DR. HENRY MAROCKIE, WEST VIRGINIA SUPERINTENDENT OF SCHOOLS, CHARLESTON, WEST VIRGINIA

Thank you for the opportunity to provide testimony regarding distance learning and its role in the education community. Distance learning, in all of the various forms from satellite-delivered courses and teleconferences to computer Internet-based learning, extends opportunities to students who may not otherwise have the chance to engage in specific subject content. The role of distance learning in the education community is to ensure that individuals are afforded the learning and achievement options to enable them to become productive citizens.

Approximately 900 West Virginia K-Adult students take advantage of distance learning offerings via satellite delivery in over 320 downlink sites located in public schools, public libraries, and higher education sites. This includes, but is not limited to, enrichment activities at the K–4 level, low enrollment classes and advanced placement courses at the middle and secondary levels to undergraduate and graduate credit courses at the higher education levels. In addition to courses, distance learning is utilized for staff development, enrichment and remedial activities, team teaching, and educational meetings. Most of our enrollment at the secondary level is in courses such as Japanese I & II, Spanish I, II & III, German, Russian, Latin, Physics, Pre Calculus, Marine Science, Astronomy, and Psychology.

West Virginia students, as well as students from other States, have benefited from the distance learning options, many of which are possible because of the Federal funding and regional or national collaboration. In 1988, West Virginia was one of the initial recipients of Star Schools funding through the Satellite Educational Resources Consortium (SERC) award. This 19-member consortium (consisting of a partnership between State departments of education and public television stations) provides States with the opportunity to share limited expertise from other States without duplicating the cost efforts. Many of our small rural schools could not provide the course offerings due to lack of enrollment numbers or qualified staff. The provisions through SERC and other Star Schools providers allow alternative solutions.

Even though the term "distance learning" became associated with interactive satellite-delivered instruction, which usually incorporated one-way video and two-way audio, distance learning through public television stations has had a successful history in West Virginia for over 25 years. The Broadcasting Authority's public television stations telecast instructional programs directly into classrooms throughout the State. Today, over 100,000 students in West Virginia are learning from this valuable service. In addition to educational programming, the public television stations provide technical engineering support for the distance learning satellite equipment at the public schools.

The West Virginia Teleconference Network provides two-way interactive distance learning capabilities via VSAT satellite delivery. There are eight permanent sites and two mobile units with the options to both transmit and receive. The mobile units allow unique opportunities for learning by transmitting live from settings other than classrooms. For example, the system was used to provide interactive staff development sessions with teachers modeling various components of teach/reteach methods. Another use introduced students to caves in West Virginia by uplinking from a cave so they could ask questions and receive answers while taking the virtual field trip. The education community also has the opportunity to use another similar two-way interactive system via telephone lines. This network was installed in sites across the State by the Department of Administration for State administrative training sessions and teleconferencing meetings. It is available to schedule for other educational use and three of the sites are located in secondary sites.

Distance learning through the Internet is yet another technology avenue to provide the educational and local communities with learning options. The West Virginia Department of Education has a partnership with Bell Atlantic to install Internet in 85 percent of the public schools by December 1996 and have been working with the other telecommunications providers to service the remaining schools. Many of today's distance learning providers are using the Internet as an interactive portion of course delivery through email, research of the worldwide web, electronic chats and distribution of materials.

As one observes the daily development of the Internet, the learning opportunities are going to be limitless, but we must see options for focused utilization for maximum learning. West Virginia was one of ten national awardees of the IBM Reinventing Education grants. The grant will focus on the use of the Internet to improve academic and SCANS (Secretary's Commission on Achieving Necessary Skills) objectives.

Coordination of distance learning in West Virginia is accomplished through a legislated Distance Learning Coordinating Council (DLCC). The Council consists of the following State agencies: West Virginia Department of Education, Educational Broadcasting Authority, Department of Administration, Library Commission, Higher Education, Secretary of Education & the Arts, EdNet (State uplink facilities) and SatNet (determines higher education course delivery). The Council works cooperatively to schedule the uplink and transmission backbone facilities, course offerings, and downlink sites, as well as address purchasing air time, providing reports and budgets to the Legislature and incorporating all types of distance learning to meet different individual and location needs.

The DLCC also received legislative funding for a "Bridging the Gap" project which utilizes satellite delivered courses and interactivity through voice phone lines and use of the Internet. Our beautiful mountainous terrain also presents a travel and time problem for students attempting to take higher education courses. The "Bridging the Gap" project provided access to the classes through the technology and changed policies/procedures in the DLCC agencies to better serve the community.

The West Virginia Legislature just recently passed Senate Bill 300, Jobs Through Education. It is a model piece of legislation that is comprehensive in addressing the needs of the community through education, the framework to accomplish the needs, the academic and skill achievement levels as students move through educational levels, and life long learning. Simply, we want our elementary students to be on or above grade level by the fourth grade; our secondary students to perform at or above the 50th percentile by the 10th grade and to obtain the necessary employment/life skills for the market place; and to address the various needs of adult learners. In order to accomplish the educational objectives, technology use is a major portion of this bill. The legislation builds upon and extends the Basic Skills/Computer Education program implemented on a statewide basis in the K–6 classrooms. Distance learning, in a variety of technology formats, will be used to educate students and the community.

For example some of our learning objectives are associated with the SCANS skills. In our rural areas of West Virginia and other States, there may not be businesses with which to partner and develop mentorships. Distance learning has and will continue to help overcome the barriers of time, distance and lack of local resources, while allowing our students to grow in a beautiful State, with low crime rate, and an extraordinary sense of work ethic and dedication. Through the appropriate use of technology, we can balance the options and provide access for learning.

Of course, no man is an island, and we cannot accomplish these tasks alone. It takes adequate Federal, State and local funding, equitable and affordable access, community and business partnerships, pooling of quality resources, initial and ongoing staff development, turnkey installations, and timely dissemination of information about the availability of distance learning opportunities. This format of cooperation and coordination, as noted above, does make a difference and works to deliver quality educational content to K-Adult students.

PREPARED STATEMENT OF JESSICA LAMBERT, DISTANCE LEARNING STUDENT, MOUNT VIEW HIGH SCHOOL, WELCH, WEST VIRGINIA

It is a pleasure to speak with you today about distance learning. Just being here in the nation's capital with U.S. Senators is indeed an honor. Yesterday afternoon, I was in my rural, southern West Virginia community of Anawalt; and today I have the opportunity to speak Japanese with Senator Rockefeller, our former Governor. This is my testimony and a perfect example for demonstrating how distance learning provides opportunities; otherwise I would not be here with you today.

I am a junior at Mount View High School, located in the coal fields of McDowell County. The name of our school is appropriate because we are located on a mountain top and have 856 students in grades 9–12. This year, 30 students enrolled in full-year distance learning courses in the foreign language areas. We had 10 students enrolled in Japanese I; 12 in Japanese II; 2 in Latin I; 1 in Latin II; 4 in Russian I; and 1 in Russian II. Last year, 35 students enrolled in courses, and Mt. View has participated in the distance learning program since 1989. Our courses are received from the Satellite Educational Resources Consortium (SERC).

Because of the low enrollments and lack of teachers in the foreign language areas, we would not have this opportunity to take the classes if we did not have distance learning. It has allowed me to take the courses I need to prepare to live and work in our global economy. Taking the courses through distance learning has also provided me with nationwide classmates. It is interesting to learn with other students from different schools and understand how their lives compare with ours.

I am very thankful that I had the chance to take Japanese through distance learning, and I hope that funding will continue so other students will have the options to take these and other courses. I look forward to using my second language in building my career opportunities.

Thank you again for letting me share my distance learning success, and thank you for providing the funding to make it happen.

Senator BURNS. Thank you very much. That is a powerful statement you make, and you bring a powerful example with you. I think this next demonstration—we will get to the rest of you in a little bit because we are going to lose some satellite time. Pat Portway, who is with the Distance Learning Association, is here. We have come a long way, Pat, since 1989, when we started talking about this. Would you introduce your guests, please? And we have a demonstration from Missoula and Butte, Montana, and Sioux Falls, South Dakota. At the Butte site, we can hear them in Butte but we cannot see them, but they can see us.

STATEMENT OF PATRICK PORTWAY, FOUNDER AND EXECUTIVE DIRECTOR, U.S. DISTANCE LEARNING ASSOCIATION, SAN RAMON, CA; ASSOCIATED BY DR. GLEN KESSLER

Mr. PORTWAY. We will be going into that very quickly. Let me just do a few introductory remarks.

The U.S. Distance Learning Association, as you know, Senator, and Senator Rockefeller certainly knows, is a 501(c)(3) organization of some 2000 members, K–12, higher education, continuing education, corporate training, and military training. I have with me

Dr. Glen Kessler, formerly of the Fairfax County Schools, who is our Washington representative, and I would ask our president, Michael Baker of Parkervision, to stand and be recognized in the back, as well, and then I am going to turn it over to Glen to introduce the demonstration, we will go through the demonstration, and then I would like to add some remarks, Senator.

Senator **BURNS**. You might want to pick the microphone up.

Dr. **KESSLER**. First, we would like to go to Margaret Leary Grade School in Butte, MT, and Don Gilmore is there. You can see Don on the screen. He is a doctoral student at the University of Montana at Missoula, and he is teaching a class in distance learning to a group of elementary students in Butte, MT, and, Don, do you want to say hello to the panel?

Mr. **GILMORE**. Good morning from Missoula.

Dr. **KESSLER**. OK, Don. Do you want to explain that the students that we see in the lower left-hand are from South Dakota, and that the students that you are teaching we cannot see, but they can hear all the Senators and see all the Senators. And so would you talk to us about this class that you are teaching and what benefits it has been able to bring to the students to be taught at a distance?

Mr. **GILMORE**. Well, what we have been trying to do is bring to the students, the third graders in Butte, a curriculum topic that without this technology would not be available to them. It is a program that takes some aspects of Japanese curriculum, mathematics curriculum, and we are trying to Americanize it so it fits with our philosophy and have some of the students in Butte experience it.

Dr. **KESSLER**. OK. Before we go to South Dakota and see the students there, Senator Pressler would like to make some comments. Then we will go to South Dakota.

The **CHAIRMAN**. Well, let us go to South Dakota. [Laughter.]

Sioux Falls Christian School: This is a high school in Sioux Falls. The teacher is Jay Tinkleberg. It is a government class called understanding the times, and the class is physically located in Sioux Falls. So I want to say hello to the Sioux Falls Christian School. Could we get them on the screen here, and could they tell us what they are learning today?

There they are waving, and I will wave back. [Laughter.]

What are you studying this morning? Can someone tell us?

Mr. **TINKLEBERG**. I guess what we are doing today is learning about a new technology available to students.

The **CHAIRMAN**. Well, welcome here. We are trying to work on this long distance learning concept from a universal service point of view in the Telecommunications Act, as well as finding ways to have classes such as this in touch with Washington, DC. The other day, I think we had a conference of 5000 people that watched one of our hearings, and so we are able to communicate.

Tell me—would the teacher just tell us what the class is studying or if you have a question for any of the Senators here, if anybody has a question for us?

Mr. **TINKLEBERG**. Well, we are studying different units. One of our units is on politics, and we have had the opportunity to find out a little bit more about distance learning and find out about telecommunications and the implications that has for us as citizens and for us as a Nation, and then the students also might have some questions they might direct toward you about some of those things, distance learning and telecommunications.

The CHAIRMAN. I think we could take one or two quick questions, if somebody speaks right up.

Mr. WARREN. My name is Stewart Warren. I have a question for you. The unit that we are using today is in the cost of $50,000. How will this technology be made more affordable to students throughout the Nation?

Senator BURNS. Well, I would like to take a stab at that, and I will say this: It is going to be through the joint efforts of communities and with telecommunications people. I think right now it costs a lot of money because our school boards and our people who hold the purse strings have not really started to allocate moneys for new technologies. As we shift from old programs to new programs I think we will see some funds become available.

It is just a matter of setting our priorities and how we are going to deliver the curricula. As we move down the road I think it will become more important; school boards, boards of regents, will see the value of this technology and start making investments in it. But it will have to be a cooperative effort not only between our local schools, our States, and our counties, and also I think the Federal Government has a hand in this.

I was just saying to Governor Rockefeller, when his student, Ms. Lambert, had to do her introduction all over again, that if we are going to go on in continuing education, then I think the Department of Labor should be involved in this. If we have retraining programs, let us be ahead of the curve instead of behind the curve in keeping people in continuing education.

So, to answer your question, I think it will be a matter of priorities, and as this becomes more known to school boards we will see the allocation of funds shift a little bit.

The CHAIRMAN. Let me add that education does cost money. If you build a building or hire teachers or whatever, it costs a certain amount of money. But this will allow government institutions to spread out the cost more to reach more people.

Let me also say that the recently enacted Telecommunication Act of 1996 does contain universal service provisions aimed at improving distance learning. Regulations to implement these provisions are being worked out by a board presently. So everything costs money, and indeed this should lower the total costs and reach more people, through the use of distance learning.

In South Dakota we do not have the same problems in Sioux Falls, where this fine class is located, as we do out West of the Missouri River, where we have a large number of young women and men who live on ranches who want to get on a computer and have lower long distance access charges. Almost every access to America Online or a similar service would be a long distance call for them. So we hope that this board that is working out the universal service concept will take that into consideration.

But as Dr. Lewis knows so well, South Dakota is tailor-made for this sort of a project, and it does cost some money to get going, but it will cost less money and serve more people in the long run.

Senator BURNS. Let us go to the school in Butte, MT, to Margaret Leary Grade School, Kate Stetzner. Kate, are you there?

Ms. STETZNER. Yes, I am.

Senator BURNS. Well, good. We cannot see you, but we can hear you.

Ms. STETZNER. Well, maybe you are better off in a little bit of a way because we are sitting here in the snow this morning. Some of the children were saying they thought they might ski home. [Laughter.]

Senator BURNS. Well, good old Montana, we are back on the front pages again, huh? [Laughter.]

Senator BURNS. I was at your school the other day and we gave out the bug award. Now I would like you to tell us about your experience with the University of Montana and this fine young man that is teaching this course from Missoula.

Ms. STETZNER. Well, we have had a great opportunity to allow these children to be able to get a taste of what distance learning can be like for all of them, and they are all sitting here real anxious wondering why they cannot see everyone. But I think that since they have had the opportunity to use this type of technology at the school itself, they really know that sometimes there are some kinks in this equipment. They are learning to be flexible learners as well as having the ability to have a different way of looking at mathematical concepts.

I think one thing, Senator, that we would like to stress is to let the children talk to you about what they have done and what they have learned.

Senator BURNS. All the hard questions are directed to Senator ROCKEFELLER. [Laughter.]

Ms. STETZNER. OK. The children are third graders who have been involved with Mr. Gilmore and this experience for the past year, and they have some questions they would like to ask you, so maybe one of them would like to start. They will give you their names.

Mr. KLOTZKO. My name is Derrick Klotzko, and I would like to know who invented this.

Senator BURNS. Well, Marconi kind of got it started, but I tell you, we cannot say who exactly invented it. But the idea, I think, comes from very entrepreneurial people who want to educate, and there have been many, many hands in this. As ideas take shape and form, they involve a lot of people who add to the teapot, so to speak.

So there have been a lot of folks, not only with the technology, but also the idea.

Ms. STETZNER. Thank you. We have another question.

Mr. ANDREWS. My name is Jonathan Andrews. Can I ask you to keep giving us more money so we can do this program more often. [Laughter.]

Senator BURNS. We will give you all we have got. How is that? [Laughter.]

Ms. STETZNER. Doug would like to tell you a little bit about what he has learned from this program.

Voice: I have learned that telecommunication is a very good thing, and half the time when I knew about this I did not even know your name. I have learned how it is a really great program, and I think a lot of home pages will get involved with this type of thing.

Ms. **STETZNER**. Well, good. Does anyone else have a question?

Voice: Who came up with this telecommunications idea?

Senator **BURNS**. I think it was Jim Exon from Nebraska. [Laughter.]

Senator **BURNS**. As ideas grow—and it is awfully nice to have third graders out there. You third graders work awful hard and get a bug award, OK?

The **CHAIRMAN**. Maybe we could have one more question from the South Dakota group. They asked such a tough question that I do not know if we should risk that, but when we get a chance.

Senator **BURNS**. Go ahead.

The **CHAIRMAN**. Can we get one more question from Sioux Falls?

Mr. **HALL**. My name is Jeremy Hall. I was wondering how the United States prevents people from other nations from violating our standards on morality.

The **CHAIRMAN**. How we prevent people from other nations?

I think Senator Exon had a hand in that. I am not passing off the question here, but I would not want to be accused of that.

Senator **BURNS**. Your good friend of the South.

Senator **EXON**. I think it is a very, very good question.

It is a very timely question. The answer to that is there is no way that we know at the present time we can force any other nation to keep from violating our standards of decency. That is what the Exon Communications Decency Act is all about. History has shown, though, that the United States of America has been a leader. When the United States of America leads, other nations follow. So what we are attempting to do in this area is to have a community standard of some type that other nations could subscribe to. We will never have a total pristine Internet. But certainly, saying we cannot do anything because it is worldwide is dodging the question, and we are not dodging that question in the Nation's capital.

I would like to ask a question, if I might, of the South Dakota audience. I am very much concerned about this and have been involved in it from its inception. I guess one of the questions I have, this is novel, this is unique, this is something that excites the students, I am sure, at all ages. I would like to have some student, if they could, tell me whether or not you have had enough of this type of learning to say without equivocation that it has helped you a great deal.

I know it is exciting to bring expert teachers into the classrooms through the distance learning processes. I am just wondering whether or not there have been experiences of any of you students where you as an individual have had some kind of a breakthrough that has excited you to the point that you have become more interested in your educational processes, because I really believe that that in the end is going to decide whether or not the amount of money that we will be spending on this system, and it is a great deal, is worth it.

Any testimonials out there?

Voice: I guess I will answer that. Recently our class did a report on chemistry and nuclear physics, and we used the Internet a lot to research those papers, and I think a lot of my classmates found that interesting and existing, to find current information on these fields from the Internet. With this telecommunications TV camera, we have not used this very often, so this is a new experience for us. But from what we had of the Internet, we were excited about that in our classroom.

Senator EXON. Thank you very much.

Thank you, Mr. Chairman.

Senator BURNS. Senator Rockefeller.

Senator ROCKEFELLER. Actually, I wanted to answer a question that I think one of your Montana students asked, and that was who invented all of this, and the answer is Arthur Clark. Arthur Clark invented this. He was the fellow who wrote "2001." It just started from a small idea and it has developed into this now gigantic potential, and there are a lot of people who are pushing for this fellow named Arthur Clark, who I daresay very few people have ever heard of, to get the Nobel Prize because of what he has done and opened up for students and people all across America.

The CHAIRMAN. Let me say that I wanted to follow up a little bit on what Senator Exon said, because in the telecommunications bill, we did make an effort to set a standard, certainly, to protect children. Of course, this new technology is changing so fast, people are using it in new ways, and some small percentage will abuse it, and we wish that were not the case.

Let me also say that I think in a city the size of Sioux Falls perhaps distance learning is not used as much as it is in some of our smaller communities. I think the fine dean from the University of South Dakota would attest that, if somebody out in a small school is going to learn Japanese or is going to get calculus at the high school level, it is currently very different for them. I find so many young women and men who want to go to the military academies from South Dakota just have not had the math and science, and it is always kind of tragic because they are fully qualified physically, but if you want to go, and I would urge people to consider going to West Point or the Air Force Academy, but so frequently they will need a year of remedial math or science. They are very fine students who have taken everything available in their local high school, but they have not had physics or they have not had calculus, but maybe they have had one or two of the subjects. So people who want to go to the military academy in smaller high schools would be able to take advanced chemistry or physics or mathematics through distance learning. It is always tough talking to a young woman or man who has excelled in sports, is fully qualified, has the IQ, but does not have those math and science courses, and that is really where we can help out in smaller communities.

Senator BURNS. Any other questions? Any other questions from Sioux Falls or Missoula or Butte, MT?

Mr. KLOTZKO. This is Derrick Klotzko, and I want to know how come we need this telecommunications.

Senator BURNS. How come we need it? Well, the more——

Mr. KLOTZKO. How come we need it?

Senator BURNS. Well, I think it exposes us to a vast array of educational opportunities. The broader the exposure, the better person we are going to make of our young people in the education system.

Sometimes, we can get locked in tunnel vision. We want to give our young people as broad a vision as we possibly can through educational opportunities, and that is the real reason for it. It is done for your young people, and it is also done for the future of the country.

I heard an FFA student say one time that we may not as young people be 100 percent of the population, but we are 100 percent of the future, and that is what drives us all for a better country.

Would you like to respond to that, Senator Rockefeller?

Senator ROCKEFELLER. I was just going to add to that, Chairman Burns, that the students that we are talking to now are in South Dakota and Montana, and I represent a State called West Virginia, which is very much the same in that while it does not have all of the farms that you do and it does not have a lot of the flat land that parts of your States have, it does have students who are rural. What telecommunications means, I think, to you and to them is in reality starting with education, and then almost in every form of life, a chance to participate on an equal basis with everybody else on anything else that is going on in the country or in the world.

For example, telecommunications can help with medicine. If one of the students, let us say, in Montana fractures an elbow or has some kind of an accident, one of the things that Senator Burns is interested in is telemedicine. Well, what is telemedicine? Telemedicine is medicine done by telecommunications. And I remember actually watching this happen. I think we both did, Conrad. A West Virginia doctor diagnosing an 11-year-old boy's physical problem in Moscow. It was all done via a television screen, and he could do it with a very close view of the kid. There was a paraprofessional with the kid so they could talk back and forth with an interpreter, and he could diagnose the disease or the problem that the boy had. It was a pediatric doctor in Morgantown, WV, diagnosing a problem of an 11-year-old in Russia. Well, now, that is obviously slightly dramatic and not typical, but it can be done very, very powerfully where some of you who live in more rural areas can hook up with your medical school, either in your own State or, if it is a specialized problem, you might want to hook up with one in a State nearby so that doctors can talk to doctors even though they are hundreds of miles apart. It saves you from having to go to the hospital and it gets you much faster treatment and much faster analysis.

So telecommunications can really help. I mean, everything we do starts with our eyes. The two eyes that we have in our head, they are hooked up to our brain, and that is our telecommunications system. Now what we are finding is we can extend it throughout the world, so that you can participate in anything that anybody else is doing who is also using telecommunications. That is very important, and it is very important particularly to rural students, who do not have as many computers and who face the tremendous expense of maintaining those computers, have that opportunity.

So I think telecommunications really is the future. It is the most exciting thing going on, I think, in the world today, in a technological point of view.

The CHAIRMAN. Could I just add to what Senator Rockefeller has said? We Senators at this table are, for the most part, industrial age men or women. You students will be information age women and men. You will be able to get into a computer quickly. When I start working on my computer at night, it is a struggle for me. But the young people coming along, in order to compete, are going to have to be computer literate, a totally different thing.

When I am really thinking I want to write something serious, I pull out a yellow legal pad. Information age people pull out a computer. We always say the electromagnetic spectrum is to the information age what oil was to the industrial age. There is a totally different type of an educated person who will be competing in the information age, which we are entering, and part of that is a solid knowledge of telecommunications, computers, and so forth.

Senator BURNS. I think this demonstrates and points out that we can sure reach out and we can sure stimulate interest. I think this is the first time that three senators ever appeared before a third grade class and asked for questions when we did not get asked "How much money do you make?" [Laughter.]

It comes up every time. But we want to thank you. I would like to thank, again, Don Gilmore.

Don, out over in your country in the Cold Springs School, I want to tip my hat a little bit. There was a young man that developed a multimedia fourth grade class at Cold Springs School, and he now works for a Telecommunications, Incorporated, TCI, a company that has done wonders about bringing up SAT scores tremendously. TCI picked him up and now he teaches in their Sparkman Center in Denver on distance learning and multimedia in the classroom. We brought him in here and he testified before our committee.

So from where you are in that Missoula Valley over there, there is great opportunity for you folks who are in the education business. We want to thank you for your interest in this.

Mr. GILMORE. I would also like to extend a thank you to you—and our funding comes from the National Science Foundation (NSF)—to be able to give these children the opportunity to experience something that they otherwise would not be able to experience. So I will just say again, thank you very much.

Senator BURNS. Thank you, again, to the teachers, Kathy Weeres from Montana, Jay Tinklenberg from South Dakota, the principals; Kate Stetzner at Margaret Leary School in Butte, MT; Vern Ten Naple at Sioux Falls Christian High School; and the technological assistance coming from Michele Burchette and Michelle McCracken of U.S. West; Mary Devany of Sioux Valley Hospital; Paul Saldo of PictureTel; and Tim Martin, Jon Robinson, Steve Munson, William Marcus, Joe Kujawa, and Mike Lundin from the University of Montana and Montana Tech, who worked together to ensure this picture today.

It takes lots of folks to do it, and you did a great job. I wish we could have seen the kids of Butte in all that snow, but here we are on the front pages again.

Thank you very much. It has been great.

Did you want to end up, Pat?

Mr. PORTWAY. Just a couple more comments, Senator, if I could.

First of all, there was a mention of the cost of the equipment. What I would like to emphasize is that the principal cost and the principal barrier to distance learning has been the continuing cost of communications itself. Of course, the Snowe-Rockefeller-Exon-Kerrey amendment is vital and the implementation of that is vital for the affordable access of schools and rural medical facilities around the country.

USDLA has submitted comments to the FCC on the implementation, and we have extra copies of those if you are interested in seeing those.

Two other points. We wanted to illustrate the fact that a wide variety of technologies can be used for distance learning. This was, of course, not a satellite transmission, it was a terrestrial data transmission, using data lines whose costs are really approximately the same as a cellular phone call. We hope they will even be lower with the Snowe-Rockefeller-Exon-Kerrey amendment. So we use a wide variety of technologies, no one technology being the only solution.

The other point that we wanted to make is that there are a number of new technologies coming down the track, particularly video on demand, server-based technology. We had an example we were going to show by videotape of Stanford University, which is currently delivering, Senator, graduate courses in engineering off of a server. They have 14 courses already on a video-on-demand environment, where a student, anytime, anyplace, from their home, from their office, even on the road, can access those classes over Internet and watch a class. In fact, one of the professors was a little upset when he found out one of his students skipped a class and watched it from his dorm room in bed. [Laughter.]

Mr. PORTWAY. So we just want to point out that there are a wide variety of technologies our members use and an extensive number of different kinds of technologies to achieve their end.

Thank you, sir.

[The prepared statement of Mr. Portway follows:]

PREPARED STATEMENT OF PATRICK S. PORTWAY, FOUNDER AND EXECUTIVE DIRECTOR OF THE UNITED STATES DISTANCE LEARNING ASSOCIATION (USDLA)

USDLA is a 501 (c)(3) nonprofit organization of over 2000 institutional, corporate and individual members with chapters in nine States and 12 more chapters in the process of formation. Our member organizations deliver electronically transmitted instruction to hundreds of thousands of students in K through 12, higher education, continuing education, corporate and military programs. Because of this extensive experience and broad base of membership, USDLA feels a special interest and responsibility to provide information and commentary on issues involving distance learning and the use of telecommunications to deliver education and training.

Distance Learning is defined by USDLA as the delivery of education or training through electronically mediated instruction it includes a wide variety of technologies including satellite, microwave (ITFS) cable, fiber optics, video, computer internet, phone lines, digital communications (ISDN) and multimedia. While USDLA does not exclude traditional correspondence courses and open universities it's membership is primarily involved with high technology delivery using a combination of video, computers and telecommunications.

NO ONE SOLUTION

It is the policy of the USDLA that no one technical solution will serve every application of distance learning.

USDLA's membership includes 2,000 organizations and individuals in K through 12, higher education, continuing ed, corporate and military training as well as suppliers of products and services to these programs. Among our members are school systems, universities, community colleges, PBS, Turner Broadcasting, AT&T, Sprint, MCI, Nynex, Pacific Bell and the U.S. Army, Navy and Airforce, IBM, Hewlett

Packard and many more. We believe this broad base of membership gives us a unique prospective on Distance Learning.

K–12

The use of Distance Learning by our nations schools has been driven by four major factors:

- Budget constraints
- The need to provide equal access to educational opportunities for rural and remote areas
- The shortage of teachers with critical skills in math, science and foreign languages
- The desire to provide supplemental materials and enrichment of curriculum through support of the class room teacher

Much of the K–12 programming is provided through satellite and cable. 84 percent of the school districts have at least one satellite receive earth station and a similar number of schools have at least one cable drop.

The volume of quality K–12 programming available by satellite is evident from the "Sat Link" publication of one of our members the Missouri School Boards Association under a Star Schools grant.

At the hearing on April 24, 1996 Mr. Portway will show examples of satellite based distance learning produced by one of our members, Oklahoma State University in Stillwater, Oklahoma. German by Satellite is available for elementary (3d & 4th grade), high school and advanced placement students. Dr. Harry Wohlert teaches German into over 250 high schools nationwide.

DIGITALLY COMPRESSED DIRECT BROADCAST SATELLITE

The increased cost of satellite transponder time has driven the use of digital compression for broadcast. Several of our members now use this technology to broadcast multiple programs over a single transponder. When combined with small earth stations like RCA's entertainment system, direct broadcast satellites can cost effectively deliver educational programs directly into schools. Westcott Communications provides video courseware to over 2500 high schools nationwide using digitally compressed satellite transmission.

TWO WAY VIDEO

The fastest growing technology in distance learning other than simple internet access is two way digitally compressed video and audio. This is the technology we will use in our live demonstration before the Committee this morning. For a cost of about $30 per hour (less than the cost of a cellular phone call) one of our members, PictureTel Corporation will connect an elementary school in Montana and one in South Dakota with the Committee in fully interactive two way audio and video communications.

Our members are using this technology to replicate the personal one-on-one teacher student interaction between high schools in the same city or to bring in a remote expert presenter from around the world. Universities are using this technology to extend classrooms into the work place for working adults.

THE FUTURE

Education and training at all levels will be enhanced by the increased competition and the new services created as a result of the new Telecommunications Act.

One technology that phone companies and cable companies have discussed for years is video-on-demand server based services. The emphasis has been on entertainment, primarily movies, available whenever you wished to view them.

One of our members, Stanford University, is using this server based technology to deliver 14 engineering courses wherever and whenever an adult student finds time to study.

ADEPT, The Asynchronous Distance Education Project, provides graduate engineering educational opportunities to working adults over internet and other telecommunication services. While the sample shown is limited by the transmission capacity of internet future broad band services into the home and office will provide better quality and the potential for full interaction. ADEPT funded by a Sloan grant is a sample of a whole new paradigm of higher education which will emanate from virtual universities now operating at the University of Maine, California State University at Monterey, Stanford and elsewhere throughout the Nation. Universities without walls accessible to students from either the work place, their home or on the road.

USDLA's Home Page on the World Wide Web: http://www.usdla.org or call 800-275-5162 internationally +1-510-606-5160.

Senator BURNS. Thank you, Pat. We appreciate your good work on continuing education. I have got to brag a little bit. I have got a daughter that graduated from Montana State University, and she will graduate from medical school at the University of Washington next spring. She accesses medical libraries without ever leaving her apartment, and downloads to do all her papers and everything like that. So we know there is a changing environment out there.

I am going to go now to Linda Roberts, who has been a good friend ever since I came to this town. She is director, Office of Educational Technology here at the Department of Education. Thank you for coming this morning.

STATEMENT OF LINDA G. ROBERTS, PH.D., DIRECTOR, OFFICE OF EDUCATIONAL TECHNOLOGY, U.S. DEPARTMENT OF EDUCATION

Dr. ROBERTS. Thank you, Senator Burns, and thank you, Senator Pressler and Senator Rockefeller, for inviting me to be here and be part of this very important hearing. I would like to submit my written testimony for the record and, in the interest of time, I would like to just take the 5 minutes and hit on some critical points that I think we all care deeply about.

First, let me tell you on behalf of the Secretary of Education, Richard Riley, how much we truly appreciate this committee's leadership in advancing the opportunities for technology for our schools, for our communities, for our universities, and for our libraries. We cannot think of a more important legacy to leave behind than the implementation of the Snowe-Rockefeller-Exon-Kerrey language in the bill and the universal service language provisions in the bill. We understand that moving forward requires that we create win-win opportunities. That is to say, a win for education, a win for learners, a win for parents, a win for communities, and equally, a win for business and industry.

We just got a little taste today of the kinds of resources and products and services that are going to be, we believe, driven by the telecommunications revolution and by the ingenuity and creativity and entrepreneurship of people all across this country. I was just in Sioux Falls, Senator Pressler. I cannot tell you how excited teachers are across the State of South Dakota because of what they see are truly important new opportunities to do better for their students and to do better for themselves as professionals.

So we are talking about an important set of opportunities for all of us. If the Secretary were here today, he would say to you that we really want to work with you and we want to work with the business community, we want to work with the education community to make it work, to truly make it work.

There is no question that distance learning and the evolution of distance learning, what it is coming to mean, is an incredibly important resource, not just for our rural and very isolated communities, but in fact a resource for learners everywhere. What we see happening are the opportunities to interact with real data, with knowledge, with people, with resources, with classrooms, and to extend everybody's horizons. The data is in. We know we can do it well. We know we can do it effectively. We know the performance of students, like the young woman here today, can be absolutely extraordinary and exceptional.

The challenge ahead lies in being prepared for the future. I would like to just talk about three of the trends that I think we all have to keep in mind as we move forward. The first of these is clearly the technology itself. The technologies are converging. Interactive video programming, as we saw today, is not just broadcast over satellite. It can be transmitted over coaxial cable or telephone lines or, increasingly, over wireless telecommunications capabilities as well.

Second, in an era when all of these technologies are coming together, what the challenge for us to do, particularly the challenge for us to do in education, is to work with the providers, to work with our communities, and to build systems that have as broad a purpose and as long a lasting life as possible. So I think, Senator Burns, by bringing together the K–12 people, the higher education people and, as you did in Montana several years ago, the health care providers, the local and State governments, all of the service providers, and those caring about economic development, you forged a strategy that is long term and long lasting.

Third, we know that we are going to be able to do more. This is one area of our economy where it is really fascinating. We are going to be able to do more with less. In other words, the compression and digital technology capabilities we have are going to be—if you think about it—able to expand the transponder capability, expand our fiber capability, expand all of the "pipes" that are out there. Our job in education is to be sure we take advantage of all of those opportunities.

Finally, particularly in the case of distance learning, and particularly when we talk about learning for all ages, we have an opportunity to encourage as broad a participation in the learning enterprise as possible. We have been able to do this through the Federal Star Schools Program, through the TIIAP Grants, through the Challenge Grant competitions. I would like to say that those encourage risk taking with technology and they encourage investment in learning. But we have not begun to scratch the surface in terms of who will be delivering education and learning, and particularly, as we think about who will be reaching our kids, our families and our adults across the country.

I will leave you with two very, very exciting examples that I think you are aware of. In the Western States now, the Governors have come together to say that it is time not to invest in bricks and mortar. It is time to invest in people and in telecommunications to create a virtual university that, as you mentioned, will reach people in different ways and far more effectively than we have ever been able to do it before, and bring adults into the higher education and post-secondary learning system, people who would never have thought of coming into that system. But because we make learning available in much more flexible, reasonable ways, we have an opportunity to educate more of our citizens all across the country.

The second example I will give you is there is an oil pipeline being built in northern California. You would ask what connection does that have to telecommunications or technology or education.

Well, the oil pipeline is going to be monitored by an incredibly sophisticated fiber network. That network is going to be dark 95 percent of the time. There is now a proposal to take that unused capacity and use it to deliver education, health care services. So there is nothing that I think we will not be able to do that we cannot imagine and work toward.

The critical need, I think, is to keep what we are learning as broadly disseminated as possible, and to continue to encourage new development in all of our sectors.

Thank you very much for inviting me here.

[The prepared statement of Dr. Roberts follows:]

PREPARED STATEMENT OF DR. LINDA G. ROBERTS, DIRECTOR, OFFICE OF EDUCATIONAL TECHNOLOGY, U.S. DEPARTMENT OF EDUCATION

Mr. Chairman and Members of the Committee, thank you for the opportunity to appear before you today. I am here to represent the Department of Education and the Clinton Administration on distance learning, and I plan to talk about several important issues:

- The knowledge base and real-life examples we now have about the effectiveness and value of distance learning;
- The major technological and educational trends that are impacting distance learning; and
- Initiatives that the administration has undertaken to advance the use of all technologies in support of improved teaching and learning.

Finally, I would like to comment briefly on S. 1278, the proposed educational satellite loan guarantee program legislation that is currently before this committee.

THE EFFECTIVENESS OF DISTANCE LEARNING

Distance learning (or the delivery of instruction via cable, fiber optic, microwave, or satellite connection) has been in use for well over a decade and continues to expand. Over 40 percent of school districts used distance learning in the 1994–95 school year, and another 30 percent had plans to add distance learning services within 2 years.[1] As a result, we now have evaluation data comparing distance learning with other forms of instruction. This is what we have learned:

- One- and two-way distance learning has expanded access to the core curriculum. Schools in rural and remote areas that could previously afford only bare bones course listings are now able to draw in a much wider range of courses from their own region and from across the country. In Alaska, for example, at least 2,500 high school students took courses in Spanish, Russian, Japanese, environmental science and marine biology during the 1994–95 school year-courses that would not have been available in their schools any other way.
- Numerous studies of the academic achievement of students in distance learning courses indicate that the performance of these students is comparable to learners in traditional classroom settings.[2]
- In many cases distance instruction is superior to that available in conventional classrooms because the distance learning courses are designed for broad distribution and can attract exceptional teachers and content experts. These courses, then, help prepare students to be competitive on a global scale.

EXAMPLES OF DISTANCE LEARNING

It is often hard to imagine what technology makes possible without telling a story or two. Here are some examples, drawn from programs funded by the Star Schools Program, that explain what distance learning means to teachers and students.

- The United Star Distance Learning Consortium provides programming to several States via satellite, cable, and microwave technology. One group of students, the children of migrant farm workers who travel yearly from South Texas to the Canadian border, are using downlink sites strategically placed along their migrant path and laptop computers to complete their Algebra I course work and stay in touch with teachers.

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[1] CCA Consulting, Inc., *Sales Guide on the K-12 Market: 1994–95*, Wellesley, MA, 1995.

[2] Moore, M.G., and Thompson, M.M., *The Effects of Distance Learning A Summary of the Literature*, Southeastern Ohio Telecommunications Consortium, 1990; Kitchen, W., *Education and Telecommunications: Partners in Progress*, testimony before the Senate Committee on Labor and Human Resources, March 11, 1987.

- The Massachusetts Corporation for Educational Telecommunications (MCET) uses multiple technologies and innovative teaching strategies to assist at-risk adolescents and young adults develop skills for health, literacy, and work readiness. MCET and its partners are working with 34 demonstration sites at schools and community-based organizations in five urban communities (Boston, Springfield, Hartford, New York City, and the District of Columbia). HealthLinks, a multimedia course offered by MCET, uses a comprehensive approach that employs satellite and computer networks, boardroom and desktop video conferencing, CD-ROM and interactive videodiscs and creative teaching strategies to help students learn the skills necessary to live healthy, productive lives.
- Also through MCET, teachers in more than 5,000 schools in Florida, Illinois, New Mexico, North Carolina, and Texas have access to staff development programming which helps them to teach the children of migrant farm workers more effectively.
- The Four Corners Distance Learning Network, a 17,000 square-mile "electronic campus" in Arizona, Colorado, New Mexico, and Utah, provides educational opportunities for 3,900 rural and Native American students.

TRENDS IN DISTANCE LEARNING

Several trends in technology and education are now having an impact on distance learning, promising to make distance learning experiences more widely available for schools, colleges and universities and for adult learning.

The first of these trends is a technological convergence. Interactive video programming isn't just broadcast over satellite; it can be transmitted over coaxial cable or the telephone network. Telecommunications providers, encouraged by the new Telecommunications Act, are rapidly preparing for an era in which all of these communications infrastructures are linked together and can transmit information digitally, whether it be voice, data, video, or audio. Telecommunications companies are deploying fiber optic cable in all parts of the U.S., including rural areas. Other companies are developing satellite-based systems that will offer broadband services to any spot on the planet. Digital transmission of programming, as opposed to analog transmission which is now commonly used, has the additional advantage of greatly increasing satellite capacity. Thus, today schools can, or soon will be able to, get distance learning through a variety of technologies, including satellite, coaxial cable, fiber optic cable, microwave, and other means.

The second of these trends is compression. While the best quality video still comes from high bandwidth connections such as a T–1 line (1.5 Megabits per second) or coaxial cable, serviceable video can be sent over today's copper wires. Much more capacity can be crowded onto the same line or onto the same satellite, by allowing data to be converted into a kind of"shorthand" that reduces the amount of raw data needed to transmit a picture.

The third of these trends is an expansion in the number and kinds of organizations that are offering distance learning. In the near future, it will not just be schools, colleges and universities that produce educational programming—it will be Hollywood studios, technology companies like Microsoft, AT&T, and Intel, proprietary institutions, and new partnerships involving private companies, universities, libraries, and museums. Earlier this year, for example, Governors of a dozen western States formed an alliance to design a "virtual university" that will make university education and adult learning widely available throughout the region.

Because of these trends, the choices in learning experiences in our schools, colleges, and universities are going to increase, and the prices, while high now, will sooner or later come down.

THE CLINTON ADMINISTRATION'S TECHNOLOGY INITIATIVE

The Clinton Administration has taken the lead in advancing and expanding the use of technology to support learning. Here are some of the efforts that will make distance learning more widely available in the future:

- *Broad Access.* The administration is committed to ensuring that all Americans have access to the benefits of the National Information Infrastructure (NII) regardless of their geographic location. We cannot tolerate—nor in the long run can we afford—a society in which some children become fully educated and others do not. The President and Vice President have challenged the communications industry to connect every classroom, library, hospital and clinic by the year 2000. The importance of distance learning for our most isolated schools and communities is one reason why the administration supported the Snowe-Rockefeller-Exon-Kerrey provisions of the Telecommunications Act, because they call for giving all schools and libraries access.

- *Extending the reach of the NII*. The Telecommunications and Information Infrastructure Assistance Program (TIIAP) in the Department of Commerce makes grants to schools, hospitals, municipal governments, and others to improve service delivery by these organizations through the application of advanced telecommunications technology.
- *Rural telecommunications infrastructure*. The Rural Utilities Service, part of the U.S. Department of Agriculture, administers grants and loan programs to assist rural and remote communities with the development of their telecommunications infrastructure. In fiscal year 1994, a subsidy of $12.4 million generated more than $500 million in Federal loan guarantees which leveraged over $2 billion in private investment in rural telecommunications infrastructure. These borrowers will use the loan program to provide initial services to 62,000 families and install 6,000 miles of fiber optic cable. Fifty-two K–12 school systems will be provided two-way interactive video services.
- *Distance learning*. The Star Schools Program of the Department of Education has significantly expanded the number of organizations offering programming to schools. Today, hundreds of thousands of students are touched by Star Schools programming, and many others by organizations that received their venture capital from the program.
- *Improving learning*. The Challenge Grants for Technology in Education, in the Department of Education, provides funding to communities seeking to develop first class learning environments with technology and actively promotes partnerships between school and software developers, telecommunications providers, museums, and other organizations.
- *Scaling up*. The President's 1997 budget includes a request for $250 million to provide seed capital to States and school districts to expand their investments in technology, including connections to the Internet, teacher training, computer equipment, and content. The President envisions $2 billion in seed capital over 5 years.

In short, the administration is working on many fronts to expand opportunity and make and higher quality teaching and learning available to Americans through the use of technology. This initiative is rooted in the principle that the real promise of technology for distance learning comes when a variety of technologies are available. This will surely include cable, wireless telephone, video dial tone, and satellite and microwave systems. The administration, therefore, would oppose any proposal that would freeze in one type of technology.

COMMENTS ON S. 1278

In the past year and a half, the cost of satellite transponder time for distance education has increased dramatically. This has had a significant short-term impact on education, as private companies have bid up the value of scarce transponder time, particularly on C-band satellites.

In the short term, this has led distance learning providers to find creative ways to reduce costs. The United Star Distance Learning Consortium, a Star Schools grantee, faced with the dilemma of substantial increases in transponder costs amounting to nearly three times their previous costs, was able to maintain its programming schedule by collaborating with its project partners in the States of Florida and Texas which resulted in lower costs.

Despite this significant short-term problem, the Administration does not support the proposal that is before this Subcommittee to create a loan guarantee program to create a dedicated educational satellite. S. 1278 would authorize the Secretary of Commerce to guarantee $270 million in loans to a non-profit, public corporation: $250 million to acquire a communications satellite system; and $20 million for 4 years of operating and management expenses of the corporation. The administration's NII policies are based on the principle of allowing the free market to determine which technologies are most viable and appropriate—and the bill would give an advantage to satellite transmission that may impede the development of other technological solutions.

Satellite capacity for educational transmissions is available and should significantly increase in the near future. I understand, for example, that the Public Broadcasting Service (PBS) has already purchased transponder capacity on a satellite and has committed this capacity to providing reasonable rates for transmission of educational programming. Furthermore, as the PBS satellite and other satellites switch to digital programming by the summer of 1997 up to eight or more channels per

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transponder will be available for every one channel available today. This will significantly reduce the cost of using satellite communications for educational purposes.

Under the required credit reform accounting for the Budget, the $250 million guarantee for the acquisition loan would have to be scored up front in the year that the subsidy was made. Because of the risky nature of the venture the subsidy rate could be as high as 100 percent. This would mean that a cost of close to $250 million are more for the guarantee of the principal and interest payments would have to be scored in the Commerce Department's budget. Therefore, the guarantee would in essence have to be treated as a grant. Further, it does not seem appropriate to provide a Federal guarantee for loans for 4 years of operating expenses for the corporation.

In the long term, the cost of distance learning programming to educational institutions will be driven down by free competition, by having a variety of technologies available to deliver instruction, and by provisions in the Telecommunications Act of 1996 that require affordable rates for schools and libraries. The creation of a dedicated educational satellite, while appealing in the short term, would not be beneficial in the long run. Further, the bill appears to be drafted to provide assistance to one specific nonprofit, public corporation. This would not stimulate competition for communication satellites.

Based on these considerations, the administration strongly opposes S. 1278.

Thank you again for the opportunity to speak at this hearing. I would be happy to answer any of the committee's questions.

Senator BURNS. Thank you. Thank you for coming today.

We move now to Dr. Kenneth Elliott, assistant professor of Psychology, Division of Social and Behavioral Sciences, University of Maine at Augusta. Now, it is not snowing in Augusta, is it?

Dr. ELLIOTT. No, it is not.

Senator BURNS. We hear we have similar weather, though.

Dr. ELLIOTT. I have heard, yes.

Senator BURNS. Thank you for coming.

STATEMENT OF KENNETH C. ELLIOTT, ASSISTANT PROFESSOR OF PSYCHOLOGY, DIVISION OF SOCIAL AND BEHAVIORAL SCIENCES, UNIVERSITY OF MAINE AT AUGUSTA

Dr. ELLIOTT. It is my pleasure. I thank you and the committee for having me. Speaking as a faculty person, I have been listening to these presentations with an intense blend of trepidation and excitement. At the University of Maine, we refer to distance education as an elephant coming into our backyard. We are anxious to make friends with it. We have great respect for it. But, also, we want to preserve what is good about the yard that we have. So it is my role, and I think it is the role of faculty, to voice both enthusiasm and caution.

Particularly, let me say something about—I feel like I am speaking for my students, but also for my faculty, of which I am the chair. My students are average age 33, rural, mostly women, nontraditional, returning to school population. They find this elephant to be an interesting critter that they never knew about when they were the age of the children we spoke with earlier. We want to make this elephant user friendly to this very different part of our student population.

So, in short, what we would like from whatever sectors of the community we can is assistance in bringing these technologies and these paradigms not only quickly, but also with rigor and even compassion to the diversity of students that we have. That is a large challenge, and we in the faculty, I think, are keenly aware of that.

So, I do believe we need to be moving on. We faculty members very much want to be moving on. But we want to move on with some care that we use technologies as sometimes we have not in the past—intelligently and constructively, on balance.

The benefits side, I think faculty members are well aware of. The issues of access, of productivity by many measures, indices of improved curriculum, all of these the panel presented very ably, and I share that conviction. The benefits of the technology and of the paradigm itself are there.

I would like to just label the possible risks that go along with these benefits, not as a naysayer and certainly not as a whiner, but simply as a person whose job is to develop quality curriculum. Possible downside and risks are, first of all, with respect to community. Community is not the same as virtual community. As fast and as enthused as we are about being on listserves and talking on E-mail, this is not the same as working with my students in East Millinocket or East Sullivan in the State of Maine. So we must remember that virtual is not the same as actual. That is point one.

Point two, of course, has been labelled the issue of the haves and the have-nots, with respect to technology.

Point three, we are very anxious that we not dilute the curriculum. This is an entertainment media as well as a news media, and now an educational media. If we look to the news industries and the entertainment industries, you can see the concern that we have in education to develop substantive, value-adding curriculum. This is a major challenge.

Fourth, we do not want to harm our students. We know that engaged learning is optimal learning. We also know that couch potatoes and those who convenience is the highest value, we are going to have a tough time getting into the mode of engaged learning. We do not want passive students. We do not want intimidated students. We do not want confused students. All of this I think requires the support not only of getting this elephant started in our backyard, but also a working part, as it were, of the community.

We do not want to undermine the institutions themselves. I would simply caution that in the development of new networks that are without place, we need to think through very carefully the impact upon existing educational institutions. We have concerns about this, not dismal prophecies, but rather there are substantive issues in the role, particularly of public education and particularly in the case of nontraditional students—of campuses themselves.

So those are my major concerns that we, the faculty, work on even as we are moving forward. I might say, at the University of Maine, we have been in the distance education part of our business since 1985. We know the risks and we know the benefits that we have already developed, and will look forward to developing. But we believe that a balanced and thoughtful approach is perhaps a good one.

Let me come to the end. We are learning as we go, and we appreciate the contributions the Federal Government has made—contributions not only of resources, but also in terms of policy and the construction of forums such as these. These are invaluable to all of our developing a more balanced perspective.

With respect to resources, at present, one-half the Nation's hardware and software technology expenditures are made with funds from Federal education programs, amounting to approximately $1 billion annually. In President Clinton's budget request, as well, there is substantial funding. Of course, in the Telecommunications Act of 1996, there are included provisions that authorize the National Education Technology Funding Corporation to receive and disburse funds in the form of grants, loans, and guarantees of loans to help leverage public and private funds to address infrastructure needs at all levels of education. We do appreciate, Senator Burns, your leadership on this issue.

The Federal Government can and must help provide resources for equipment, software, technical assistance and, importantly, professional development. It can help support a framework that encourages development of learning software, videotape and satellite links. It can help protect intellectual property rights that balance free inquiry with the right to benefit from one's work. We must balance the educational needs of fair use with the legitimate property rights of its creators.

So, again, I thank you very much, Senator, for having me here. If any of you happen to be in the Northeast corner of this United States, please come and see distance education not at a distance.

[The prepared statement of Dr. Elliott follows:]

PREPARED STATEMENT OF DR. KEN ELLIOTT, PROFESSOR OF PSYCHOLOGY, UNIVERSITY OF MAINE, ON BEHALF OF THE NATIONAL EDUCATION ASSOCIATION

Mr. Chairman and Members of the Committee, I am Ken Elliott, professor of psychology at the University of Maine in Augusta. I appreciate this opportunity to speak to you today on behalf of the National Education Association, which represents 2.2 million faculty and staff in the nation's elementary, secondary, vocational, and postsecondary schools, colleges, and universities.

Ready or not, the world is accelerating toward an electronically driven, information-based society. Students must understand the intricate applications of technology to succeed and thrive. America's students, particularly those most at risk of school failure, must become proficient in the use of technology and its applications.

Two overarching objectives drive the Nation's investment in education technology. Technology is an essential tool to help teachers teach and students learn. At the same time, schools must use technology to prepare students for jobs of the future. Today, virtually all jobs require the use of sophisticated technology, from computerized inventories on a loading dock to the telemetry to guide missile systems.

Distance learning is a part of this technological innovation in education, and it offers tremendous potential for American education. Many Americans would be amazed at the extent of distance learning opportunities available in America's public schools today. Where once students in rural Nebraska or Montana lacked access to qualified instructors in Russian or Chinese, today's students link with classrooms hundreds or even thousands of miles away. Attention deficits, reading, or memory disorders limit students' scope of knowledge, but today programmed videotaped instruction allows for repetition, start and stop capability, and a wealth of aural and visual information that reinforce learning. Where rural and urban students once suffered from the limits of sparse libraries, students have access to engaging data bases, extensive resource libraries, and the help and suggestions of others on the Web asking similar questions.

The potential is realized for many students. Colleges and universities have played an important leadership role in the development of computer networks, programs, teaching and learning systems, and every other aspect of the knowledge economy. In my work as a professor, I teach basic and specialized psychology with from 50 to 250 students in my classes, but only perhaps 20 in the origination classroom. I have participated in some of the potential and experienced some of the limits of distance learning.

Distance learning programs, including the transmission of interactive instruction via broadcast, satellite, cable, video, and other means, are successfully bringing specialized and otherwise unavailable courses into the classroom, particularly in resource-poor schools. More than 10,000 schools today are using distance learning for direct instruction and staff development.

DISTANCE LEARNING AND SCHOOL COMMUNITIES

No matter how sophisticated our technology becomes, we must remember that the human touch is a critical element of effective education. Yes, a few special people can learn the equivalent of many degrees through self-directed reading. And computers offer individuals the ability to learn and succeed with a minimum of guidance. But most of us still need a framework to help facts become knowledge—with ongoing guidance from a capable teacher.

Recently, Governors in 13 western States proposed the development of "virtual university," touting the capabilities of advanced technology-based teaching and learning as a means to shift the focus of education from "seat time" to competency based, individualized, consumer-focused curriculum. Without question, creating an educational system that overcomes the boundaries of time and location is exciting, but we must not lose sight of what works in traditional education and learning communities.

Education began as an intimate, family and community endeavor, a source of common culture. Colleges and universities later were modeled after the ideal of an 'academy of scholars' originating in ancient Greece. Universities were cultural cornerstones. Libraries were storehouses of shared knowledge. Faculties were assembled to serve as mentors, something other than 'course managers' and product engineers. Faculties were, and are, dedicated to more than disseminating information, they were, and are, charged with teaching. Attending a university remains an important rite of passage for students to gain independence in a community where they are guided, challenged, and tested.

A 4-year study recently completed by the National Center on Postsecondary Teaching, Learning, and Assessment, *Realizing the Potential: Improving Postsecondary Teaching, Learning, and Assessment*, concluded that "Students' encounters with new and different ideas and people via student-faculty and student-student contact" are a vital part of learning.

Of course, there is interaction in distance learning, but it can never wholly replace the learning community of schools, colleges, and universities.

Education technology has another significant limit to its potential. At every level of America's public schools, infrastructure, equipment, and technical assistance are in short supply. While almost every school has some computers, very few have enough to meet student demands. Many computers used in schools, colleges, and universities are too outdated to run new software or provide interactive capabilities. Aging facilities have inadequate electrical and phone lines that cannot accommodate computer networks. Most schools and colleges have some television sets for instruction, and some even have satellite dishes to pick up public and commercial instructional programming.

OUTSTANDING NEEDS

But there is still much to be done. The main reasons schools do not have or use technology in teaching and learning are limited funding, limited or inadequate equipment, and too few access points in school buildings. Too often, equipment and training budgets are among the first to be cut in times of fiscal restraint from Federal, State, or local budget cuts.

- Only 9 percent of all classrooms are wired for telephones and modems.
- Much of the hardware installed in schools is outdated, or soon will be outdated. Nine out of 10 school districts allocate up to 20 percent of their technology budgets for replacement purposes.
- Sharp disparities exist in the ability of school districts to provide hardware, software, and teacher education to support the use of technology in teaching and learning.

Postsecondary institutions suffer the same inequities in access to learning technologies. While most professors have phones in their offices, few have phone lines and modems in their classrooms. Many college and university facilities lack the infrastructure or equipment to accommodate learning technologies.

Another key problem colleges and universities face is the lack of adequate training and support to use information systems effectively. College faculty and staff, and their colleagues in elementary and secondary schools, are eager to learn how to utilize distance learning technologies, electronic data bases, etc., but without the guidance and expertise of qualified people, fancy electronics become expensive paperweights.

The result is a widening gap between the high expectations of an increasingly technological society and the inability of most schools, colleges, and universities—particularly in urban and rural areas—to prepare students for the challenges of the future. Federal leadership and resources continue to be essential to addressing these needs.

WHAT WORKS IN DISTANCE LEARNING

We can post some notable successes. AS 1995 survey of more than 130 recent studies found that using technology in teaching and learning improved student outcomes in English, mathematics, science, and social studies. A congressionally mandated review of 47 comparisons of multimedia instruction with more conventional approaches found time savings of 30 percent, improved achievement of 30 percent, and cost savings of 40 percent. The review found a direct and positive link between the amount of student interaction with learning technologies and instructional effectiveness. A pilot program in New York—focusing on remedial and low-achieving students—showed gains of 80 percent in reading and 90 percent in math achievement when computers were used.

NEA recently conducted in-depth interviews with education chairs of State legislatures in 49 States. All the committee chairs wholeheartedly endorsed the expanded use of technology as a means for delivering education instruction in higher education, and they are willing to provide funding for it. There are a variety of reasons legislators give for their faith in technology to solve problems. It is viewed as providing a critical pathway for linking colleges and universities with the public schools. Technology can provide access to students in remote locations in sparsely populated States.

But learning technology is not a panacea. Distance learning is not necessarily a less expensive way of educating students. There is a misguided faith that technology will eliminate the necessity to build, expand, or renovate college campuses. For the reasons stated above, distance learning can never fully replace the school community—in colleges, universities, or K–12 schools.

We are also concerned about quality control in various learning media. Few school systems or universities have an organized program for incorporating multi-media learning into an instructional program with high standards. Faculty and teachers must be involved in the development of distance learning courses to assure their content is of high quality, the sequence of material is presented in a helpful fashion, and that the interaction with students and assessment of student performance is on a par with the academic quality one expects from America's colleges and universities.

To date, no State or institution has established professional and accreditation standards for distance learning courses. High standards for student performance and program quality are as important in distance learning as in any other program of education.

We are learning as we go. And we appreciate the contributions the Federal Government has made. Presently, the U.S. Department of Education supports distance learning in many ways.

FEDERAL SUPPORT FOR TECHNOLOGY

At present, about one-half of the Nation's hardware and software technology expenditures are made with funds from Federal education programs, amounting to approximately $1 billion annually.

Much of the Federal financial support for learning technology and systems comes from Improving America's Schools Act programs such as Title I basic and advanced skills programs, Title VI block grants, and Title II professional development. Helping teachers get comfortable with learning technologies is essential to their effective use.

Goals 2000 funds were an essential part of Oklahoma's recent statewide technology initiative. The State used its entire FY1995 Goals 2000 allocation to fund equipment and training set to high, statewide student performance standards.

For many years, Federal funds for vocational education have proven a vital means of keeping job training relevant to the modern workplace.

In addition, President Clinton's budget proposals include significant resources dedicated to expanding access to technology. The President has requested $250 million in FY1997 to help establish a $2 billion, 5-year Technology Literacy Challenge Fund, and another $60 million in FY1997 for the National Challenge Grants for Technology in Education to stimulate partnerships between technology developers, telecommunications service providers, and educators to develop new high-performance learning environments. The program will help to ensure that disadvantaged students are not excluded as new technologies become integrated into school curricula.

The President has requested $15 million in FY1997 to support technical assistance consortia for technology. These consortia will provide guidance to States and local school districts in training teachers and librarians to use technology effectively. The goal is to leverage existing resources and expertise from the private sector, school districts, universities, research centers, and Federal agencies such as the Department of Energy laboratories.

The President has requested $25 million for the Star Schools program. Enacted in 1988, Star Schools projects have served more than 5,000 schools in 48 States. The program began with small rural schools, but it is now equally valuable to students in urban schools. Projects offer direct, interactive technology, video field trips, and enrichment activities through the use of satellites, cable, fiber optics, interactive videodiscs, and the Internet. The President's budget would provide $39 million in grants to States to help disabled individuals of all ages gain access to assertive technology devices and services. The administration also recommends $7 million to support development of educational programming for preschool and elementary school children and their parents to promote school readiness.

The Telecommunications Act of 1996 includes provisions that authorize the National Education Technology Funding Corporation to receive and disburse funds in the form of grants, loans, and guarantees of loans to help leverage public and private funds to address infrastructure needs at the elementary, secondary, vocational, and postsecondary levels. We appreciate Senator Burns' leadership on this issue.

CONCLUSION

The challenges and opportunities that distance learning presents must be worked out by institutions, by the users of electronic learning systems, and by the States and localities. There cannot be a national plan for using technology in education. But the Federal Government can and must help provide resources for equipment, software, technical assistance, and professional development. It can help support a framework that encourages development of learning software, videotape, and satellite links. And it can help protect intellectual property rights that balance free inquiry with the right to benefit from one's work.

Faculty are increasingly concerned about protecting their professional lives. As institutions look to distance learning as an opportunity to reach new student populations and supplement revenues, faculty see a diminution of their rights and devaluation of their skills. Only the Federal Government can assure that faculty and teachers own the products of their creativity. We oppose any effort to weaken existing copyright laws that would undermine our members' ownership of the fruits of their labor.

We appreciate this committee's attention to these issues and its leadership in an exciting new frontier for education in America.

Senator BURNS. Thank you very much.

I am going to move the questioning now to Senator Rockefeller.

Senator ROCKEFELLER. I was going to start off with you, Jessica, but I just wanted to ask Dr. Elliott and also Dr. Marockie something. I was very interested in your thoughts—there was a degree of tentativeness and you were very honest—and I was thinking about the power of an idea when it comes along. In a sense, it is sort of like the corner grocery store was a much more comfortable place. It was a much more real community. It was a much more honest classroom for purchasing something. But, then, they just went, because these huge ideas called retail stores came along and they just wiped them out.

So it is philosophically, in America, that that is the way life has gone for us. If you take Jessica, for example, if you take the value, the moral value of having a direct interactive exchange with your students—in other words, a real community experience in a classroom and we keep that intact, it may be that we have to choose in some instances between doing that and, for example, giving Jessica and her classmates and others like her across America—of whom there are millions and millions—a chance to learn that she would not otherwise have. She has it now because of the much larger technological idea.

It is almost impossible to stop technology. It is not in America's habit or makeup or constitution to stop technology.

Dr. ELLIOTT. And neither would we want that.

Senator ROCKEFELLER. So help me understand, one, the natural sense of reluctance on your part about this, and yet this is going to happen.

Dr. ELLIOTT. Oh, it is happening, indeed. Let me be very, very clear, the Luddite position is not mine. What I am hoping is, just as a carpenter walks into a shop of tools and at first sight it looks like tools on a wall, but gradually which tools for what purpose becomes the question to ask. Frankly, the most difficult part is the questions we are asking today, and that is: Technology, yes, no, good, bad?

If for specific student populations and specific curriculum we design specific packages of distance education, then we will do the least amount of harm. If we, on the other hand, look at one package suits all, and that package is technology, the same at K–12 and for my 80-year-old college student, then we will be making a mistake.

So it is a question of forming our inquiry in intelligent and person-centered ways.

Senator ROCKEFELLER. And understanding that this change, too, is an evolutionary process. Even as we went from 25 kids to 40 kids per class, down to 15—I think we have down in West Virginia—that really affects real community interchange. So everything evolves, right?

Dr. ELLIOTT. Everything evolves. The trick is at what pace and with what review of quality. Specifically here, the issue of accreditation and the issue of forums, whereby educators of specific population can find common ground on educational standards within this environment are things that need to happen soon. Let me add, too, that I have done a bit of a survey with the accrediting body, at least in my area, the New England accrediting region. The specific standards of accreditation relevant to this media are yet to be articulated.

I have also spoken with the WCHE in the West and I believe the same is the case. There is a document of best practices. There is not yet a clear articulation of standards of accreditation. This is a regulatory matter.

Senator ROCKEFELLER. Not from us, but at the FCC. That is where we have to focus our attention, right, Dr. Roberts, to make sure they do the right thing in their rulemaking process? I mean it is absolutely fascinating, this whole Snowe-Rockefeller-Exon-Kerrey thing, which I think is a big part of the Telecommunications Act. It comes down to things which the public will never see or ever hear about.

I mean we debated that here in public. We are very clear; it passed 98 to 1 on the floor, did it not, Senator Pressler? I mean 98 to 1. Yet, through the rulemaking process, these Bell companies, with all of their lawyers, can subvert the actual legislation by using a per capita count or whatever it is they have up their sleeves. I am just saying that I am really suspicious of them right now. I am going to watch them like a hawk, and you are, too. I know Dick Riley will.

Dr. **Roberts**. Yes, I was going to say that I think that the most important thing that happened in the proceeding so far is the number of groups and entities that took the time and effort to provide very, very thoughtful input to the Joint Board of the FCC. We met with a number of people from the FCC yesterday. We are working very closely. Our job is to educate. Our job is to help people.

Senator **Rockefeller**. You better get five of them, because Reed Hundt needs five votes to prevail.

Dr. **Roberts**. Yes. But we have to get the public, too. We have to get the public as a whole understanding why this is important. That is why I think that, as much as possible, hearings like this that identify the opportunities, that talk about how technology really makes a difference in the lives of real people that you talked about and that you talked about, I think that is the way you ultimately tell the story, too.

Senator **Rockefeller**. My time is up. I will come back.

Senator **Burns**. Senator Pressler.

The **Chairman**. I want to commend Senator Rockefeller again for his work as we worked through that important section of the bill.

Let me ask a question of Dr. Lewis. How much of the University of South Dakota's student body is now taught through distance learning?

Dr. **Lewis**. Larry, that is a tough question, because I am not sure exactly how you mean to define that. But let me tell you this. We served well over 1,200 students last year in distance learning. Now, as part of the University, we are running about 7,000 students on our campus and at our remote sites. How that breaks out depends on how you define the distance learning piece. It is certainly a significant number, but not as many as we could serve if all of this was already running smoothly and we got all of those changes that we need.

The **Chairman**. How about that high school student out there who wants to take math or physics or calculus, how do they take their exam or how do they find out about the program, and who gives that program?

Dr. **Lewis**. Well, Larry, we just started delivering to the satellite sites at these 70 small schools, Boudle, Faith, Dupree, those small schools around the State, just this fall. So we are working with the Department of Education and the State, with DECA, and other groups to get that information out to all of the superintendents and principals in the State. They can take those courses for dual credit, which is a wonderful opportunity, because they can get college credit while going to high school. So they can get a jump on that.

There was just a new Senate bill that was passed within the State that would remove the prohibition from the school systems for paying for those as well.

The **Chairman**. I guess I am equally eager to see a young farm or ranch child be able to hook their computer into the Internet or America Online without too expensive a long distance call. What new things can we do in this area?

Because, obviously, if they are going to be information age women and men, they have got to be able to use that computer. In the city, it is a local call, although using America Online, I sometimes cannot access it with a local call, because there are too many other people calling at night—at the same time I do. I do not know why that is.

But, in any event, how can we do something more for that ranch child out there in Wall, SD, or out near Faith, SD? Conrad Burns knows everything about South Dakota, because he used to be with the Hereford Association. He puts me to shame with his knowledge of families and so forth in the poled Hereford. He knows the difference between poled Herefords and horned Herefords. But we will not go into that this morning.

Dr. LEWIS. Having owned some of those, I can appreciate that.

Let me tell you that we must, Senator Pressler, provide that sort of local access. As I said earlier, it looks to us at this point that only 10 percent of the K–12 institutions in South Dakota have that local access. So we need to, in some way—and I think Senator Rockefeller alluded to that several times—I think he tried to write the legislation. Now we need to make sure that they are living up to the legislation. That is that these delivery systems, delivery agencies, will in fact come through and help assist in creating a structure to cover all of South Dakota. We need to keep them towing the line on that and not let them back away from that responsibility.

The CHAIRMAN. I might say that we have Laska Showenfelder, one of our State public utility commissioners, serving on that board. I work closely with her, and I think we will continue to work to be sure that that responsibility is met.

[Prepared statement of Senator Pressler follows:]

PREPARED STATEMENT OF SENATOR PRESSLER

I want to thank the Chairman of our Science Subcommittee, Senator Burns, for holding this hearing on the important topic of distance learning. I also want to take this opportunity to welcome Dr. Janet K. Louis, the Dean of Continuing Education at the University of South Dakota, who is here as one of the witnesses. Finally, I understand, later in the hearing, we will be hearing from a government class at Sioux Falls Christian High School in an interactive distance learning demonstration. I am especially looking forward to seeing how distance learning is being used to educate our young people in South Dakota.

As I see it, distance learning represents a perfect union between science and education. Increasingly, technology is generating advances in every sector of our economy and society so it is not surprising technology now has been applied to the delivery of educational services. With its jurisdiction over Federal science and technology matters, the Commerce Committee has a special interest in helping develop ways in which our communications and computing technologies can be used to advance national educational goals and objectives.

For the citizens of my home State of South Dakota, distance learning is not just a matter of convenience. Every citizen should have access to a quality education. Educational opportunities should not be denied simply because a student lives too far away or comes from modest means. Distance learning holds the promise of dramatically expanding the access of those South Dakotans and citizens of other States who are geographically isolated or economically disadvantaged. That is one of the reasons I am intensely interested in exploring cost-effective ways in which the Federal Government might help the distance learning activities in the United States grow and improve.

If distance learning continues to develop successfully, it will revolutionize how we educate our community. In the past, if a course were not available locally, a student would have to forego it, obtain it through a correspondence school program, or attend a school outside the State providing the instruction. Now, however, thanks to distance learning, the student can remain at his local school and still receive the instruction on an equal footing with the students sitting in the professor's home classroom. With the more sophisticated distance learning programs, "virtual" classrooms have been created in which students and teachers hundreds of miles apart are brought together through advanced communications technology. In those distance learning programs using interactive technology, the students and professors communicate with each other as if they were in the same room. Distance learning, with its added class flexibility, also has increased the attractiveness of continuing education programs, whose adult students usually have jobs and families.

The purpose of this hearing is to learn more about the distance learning movement, and to explore the appropriate role of the Federal Government in providing assistance. In this budget environment—with many worthy programs competing for scarce dollars—it has become increasingly difficult to support emerging concepts like distance learning. Nevertheless, we in Congress must try.

The recently enacted telecommunications reform legislation I introduced last year has removed some of the longstanding artificial barriers between different segments of the telecommunications industry in the hopes of stimulating more competition and improved and more diverse services for the taxpayer. It is my belief this new law, by opening the free market, will bring together the various telecommunications technologies in a significant way. By so doing, it will help accelerate the development of distance learning in those States that can most take advantage of it. I am hopeful one by-product of this landmark legislation will be a heightened interest and investment by the telecommunications industry in distance learning activities around the country.

I understand we will be looking at a number of proposals to help distance learning, including Senator Burns' bill to establish a loan guarantee program to support a dedicated educational satellite system. In addition, we will examine the various delivery systems used to provide distance learning and ways in which those technologies might be improved. I look forward to hearing about these concepts and again let me welcome Dr. Louis and our other witnesses to the Science Subcommittee.

Mr. Chairman, I want to say how proud I am of the testimony of all these witnesses, especially Dr. Lewis.

Senator BURNS. Thank you very much, Chairman Pressler.

I have one question. I want to go back to Dr. Elliott, because all of you made your statements and you answered a lot of my questions up here that I already had written out. In this reference you made to the elephant in the backyard, you could have said donkey. [Laughter.]

I should not even talk about elephants and donkeys. [Laughter.]

But I think whenever we talk about curriculum and some of your reservations—and I can relate to those, although I am not a schoolteacher—the experience of two-way interaction, rather than just on a taped or one-way conversation, will speed this evolution up about credibility and accreditation on how we interact with our students. Would you agree with that statement?

Dr. ELLIOTT. Yes, I would.

Senator BURNS. That is a pretty short answer.

Dr. ELLIOTT. Would you like a longer one? [Laughter.]

Senator BURNS. I used to be an old TV guy and I used to do interviews. I will tell you that the toughest interview in the world was Mike Mansfield when he was majority leader of this body. You would take 15 minutes to ask him a question and he would say "yep," and that is it.

Any other questions for this panel? This has been a great panel. Senator Rockefeller.

Senator ROCKEFELLER. I just wanted to ask Jessica Lambert, when you do your Japanese studies, the teacher who teaches you is from where? Where does she teach or he teach?

Ms. LAMBERT. The satellite comes in from Nebraska.

Senator ROCKEFELLER. From Nebraska. So it was like you had a predecessor, did you not, a young man?

Ms. LAMBERT. Yes.

Senator ROCKEFELLER. It is interesting, it is a Nebraska Japanese teacher teaching a McDowell County, WV student. There is no other way you could have gotten the Japanese language, is there?

Ms. LAMBERT. No. Because of the area we live and its location and the economic standing, we could not.

Senator ROCKEFELLER. Well, it is really two things, is it not? Number one, that it is an area which is fighting hard economically. But also there just do not happen to be any Japanese people, much less teachers, I think, living in that area. So you could not have gotten it.

Dr. MAROCKIE. But, Senator, to get to the questions that Dr. Elliott raised about the engaged learning, which we all know is very important, in Jessica's case, there is also a teacher in the classroom with Jessica in McDowell County. Now, it may not be an expert in Japanese, but certainly is equipped well enough to engage the students in interacting with each other and interacting with the teacher and asking the appropriate questions of the expert on the distance learning.

So while I agree with Dr. Elliott about the importance of that, I think a lot has been done to recognize it is important and to cover for that. Now, as Senator Burns said, it costs a little bit extra, and that is why your amendment is so critical to us in the education field, because without these reduced costs, we cannot make this happen.

To just do distance learning with Jessica in a classroom and not have that local teacher engage the students is taking a major part of the instructional process out of it. In my judgment, that gets to what I said earlier. It eliminates the equity of instruction which we now are able to provide.

So when you think about the impact on students, as you said, the SREC amendment is vital to its importance.

Senator ROCKEFELLER. One more thing. West Virginia and the program with Bell Atlantic that you are talking about are helping us put computers throughout the classroom. But the fact of the matter is that putting a computer in a classroom, whether it is Jessica's or somebody in Brooke County—no, it was not Brook County——

Dr. MAROCKIE. The classrooms are everywhere.

Senator ROCKEFELLER. I know. But I was just trying to figure where you were?

Dr. MAROCKIE. Mine?

Senator ROCKEFELLER. Yes.

Dr. MAROCKIE. Wheeling, Ohio County.

Senator ROCKEFELLER. Ohio County, that was it. But just having the computer there, that is just the very first step. I mean the question is: What happens after that? How do you pay for it? How is the cost of using that machine, implementing that machine, keeping that machine hooked up—the computer and all that goes along with it—how is that paid for?

I think that is where the Snowe-Rockefeller amendment becomes so critical. Because so often people think that gee, we have got a computer in our classroom, our problems are solved.

Dr. MAROCKIE. That is correct.

Senator ROCKEFELLER. That is not true, is it?

Dr. MAROCKIE. Not true at all. The requirement for the staff development, for the maintenance, for the wiring and all of those kinds of things are equally as important. But what it also does for us, Senator, in the impact that this technology is making on classrooms, it is not uncommon, it is not uncommon for teachers—and as we have heard a number say today—teachers have eliminated the myth in this country that they will not use technology in the classroom. They will in fact use it. All they need is the training to go along with it.

But even with the good ones, the good ones who are well trained, it is not uncommon for them to tell us that the student who is often the best student in the traditional classroom instruction is often not the best student when they go to the computer, and vice-versa. The student who is often not the best because of the learning senses of auditory and perception, who is not often the best student in the traditional classroom, once they get to the computer and the interacting and the fairness and all of that, become excited and start a whole new dimension in their lives and ask questions.

When you talk with teachers about what happens with young people who do that through the years, they will tell you, as they get older, there are inquisitive gains, their asking questions in the classrooms increases, and they just simply expand their horizons of learning from where they started out in the beginning. But your point about what you need to do this is critical. You cannot lay it all on the States. Do not expect the Federal to do it. But the technology industry has to play a significant part in this.

Senator ROCKEFELLER. I think the combination—and I will end here—is that both the school and the universal service fund, set up within the telecommunications bill, have to participate. I think it is very important for the school to participate financially in this. Because that is the way you get accountability. That is the way you get them to really focus and to make the very, very best of it. Because they are spending part of their dollars, they are just not getting everything.

Dr. MAROCKIE. I agree with that.

Senator ROCKEFELLER. So it is a combination.

Dr. MAROCKIE. A combination.

Senator ROCKEFELLER. OK. Does anybody else have anything they want to say?

Dr. ROBERTS. I just want to mention that in the written testimony I talk much more about the Administration's technology initiative and the four goals. We talk about four areas that we have got to focus on at the same time: training for teachers and support for teachers as they use technology. You can invest as much as you want in hardware and in connections, which are the other two pillars, but if you do not invest in the people in the long term—and it is over a long term—you are not going to nearly get as close to the power of the technologies as you could.

Finally, and I think this was a theme that came out through all the discussions, you have got to know what you want to use the technology for, what the educational goals are that you are trying to accomplish. There is no silver bullet or no single solution to meeting needs and to addressing the educational goals that our schools and our universities and our communities have. Again, I would reiterate that it is an investment strategy, as you said, that involves the local level, the States, the Federal Government, and the private sector. It is a very challenging time to be working in this policy arena.

Senator ROCKEFELLER. Good. I am very grateful to all of you on our first panel for taking the time, and I want to thank you and dismiss you. Jessica, thanks a lot.

Our second panel is Ms. Shelly Weinstein, president and chief executive officer of the National Education and Telecommunications Organization. Could we have silence, please, in the hearing room? And, second, Mr. David Jupin, general manager of Network Systems, COMSAT; Dr. Carl Swearingen, president, Georgia Bell South Telecommunications, out of Atlanta; and Mr. Pat Wright, who is senior vice president of Education, ETC, with TCI and also out of Washington.

Ms. Weinstein, should we start with you?

STATEMENT OF SHELLY WEINSTEIN, PRESIDENT AND CEO, NATIONAL EDUCATION TELECOMMUNICATIONS ORGANIZATION

Ms. WEINSTEIN. Thank you very much, Mr. Rockefeller, Mr. Burns, and Mr. Pressler. I regret that Mr. Exon is not here. It is very meaningful and important to him. But thank you for the opportunity to speak to you today about something that is very, very important. I would like to be sure that our written and oral testimony is put into the record.

Senator ROCKEFELLER. It is done.

Ms. WEINSTEIN. Thank you. I would like to just very briefly make my remarks in summary of what that is, and then perhaps take a moment or two to go on and respond to some of the important issues that were raised by the users.

The National Education Telecommunications Organization and EDSAT, frequently called NETO/EDSAT, is a not-for-profit non-government cooperative-style organization created to improve and reform American education through the use of an integrated nationwide satellite-based telecommunications system, linked with existing cable and telephone lines dedicated to interact with instruction, education and training through video, voice and data, for schools, colleges, universities, States, and work places. Our members are school districts, universities, community colleges, library, State agencies, and the private sector, who all deliver and receive their interactive instruction, training and information in U.S. classrooms. I think one of the most important things that was brought out this morning as well as the understanding of this committee is that this distance ed holds greater promise for equal educational opportunity than ever before in the history of this Nation for all students, without regard to wealth, geographic location or the size of the community. What I would like to talk to you about today is the status of U.S. distance ed, its growth and its needs as an education industry in crisis.

There are more than 200 small distance education providers who access hundreds of thousands of K through 12 schools, colleges and work places for use by millions of students and teachers at all levels of education. In 1994, distance ed used more than 100,000 hours of satellite hours; almost half of the 16,000 school districts received some form of instruction through this technology; and in the same year, we know that 30 percent of U.S. higher ed institutions reported that they used distance ed for accredited, non-accredited, graduate and undergraduate courses, and another 28 percent had plans in the same year to add distance education services.

This covers more than 3 million higher education students in that category of higher-education college. This growth in distance education, however, took a major downturn in 1995, and it is still plummeting. What I mean by downturn, it is the numbers of course offerings substantially turned down because of the satellite shortages and skyrocketing prices. We cannot forget that in an information economy, education is the biggest information-based industry in modern economies, and in the aggregate, the education market is as large as many commercial markets and growing exponentially. It spends in excess of $2 billion on distance ed—it will spend—by the end of the century, with most of it coming from State and local tax dollars.

The explosion in the use of distance ed has been primarily attributed to satellite technology because it responds to the many questions that you all asked earlier. It is ubiquitous everywhere. It offers low per-student costs, and it provides easy enduser access nationwide to greater and greater numbers. Schools need and use multiple instructional programming simultaneously to every part of the State and the Nation at low unit costs. Fiber lines are too costly for multiple classroom use for the foreseeable future, and the cable and copper lines offer the local link or connection into the classroom for what we commonly call the last mile.

The barriers to the systemic integration of telecommunications tools in teaching and learning are the educators' need for equity, for low costs, for predictability in services and for governance, which I hope I get a chance to come back and talk to you about. It addresses the many questions that you have been asking about. The education market currently is fragmented and disorganized. It spreads across the sky in its use of satellites.

On the commercial side, the operations and financial structures which are based on distance, on bandwidth and on numbers are incompatible with the education mission and budget. In the aggregate, the education sector is a big user in the telecommunication industry. Individually, they fall into the costly and unpredictable occasional users' category in commercial industries.

NETO/EDSAT supports Senate bill 1278 for loan guarantees to create an education satellite. Its benefits are that it encourages co-location of the education users on a satellite and minimizes the risks to the private sector investors. It provides the programmers access to a growing base of student and teacher users, and it offers receiving schools greater access to a diversity of program choices.

If I might just give you a little example of what we know from another industry in this country. The growth in the cable industry can be directly attributed to the decision of major programmers, such as Mr. Ted Turner, a Montanan I believe, Mr. Jerry Levin of HBO, who 15 years ago all got together and said, What if we put all of our programming on one satellite and create what we call a group or a neighborhood of satellite programmers? This gave you and I, the consumers, the choices of channels in our homes.

In this case, with an education satellite, similar growth can be anticipated for education programmers. What we expect to happen is those who collate to one satellite to provide interactive, simultaneous, diverse choices in programming will have greater and greater numbers of choices. However, I must caution you that the most important thing is that with the passage of this legislation it will take about 3 to 4 years to create an education satellite. Distance ed needs a short-term solution to address the debilitating satellite shortage and skyrocketing prices that it currently faces.

A satellite shortage, we know, hit the commercial broadcast and cable industries at the end of 1994. We know the demand outgrew the supply, and so the pricing was pushed up, in many cases, by 500 percent. It is expected that the shortage will abate for the commercial sector sometime after 1998–99. However, it is not likely to abate for the education market until approximately 2007 or 2008. I would remind you that that would mean that students that are entering kindergarten or first grade this year will be graduating high school before they have realized any modern tools within their class setting.

This shortage also further underscores the need for an education satellite to immunize and protect the education industry from the vagaries of telecommunications market changes. We predict that by 1998–99, the U.S. distance ed field as used by millions of students and teachers today will not be around in its present form without immediate intervention.

What we propose is that—we have gone to NASA—and we propose that it dedicate its TDRS 6 satellite to education as the primary user for a limited time—3 years only. We propose that we would equitably deliver the satellite services at low and stable costs to all schools nationwide. It will impose no costs on nor subsidy from NASA. In fact, on the plan that we propose, NASA will realize a minimum of 30 million against other costs over the 3 years, and that it will allow distance ed providers, the small colleges and universities that currently are doing it and the users, to stabilize their services by the fall of 1996—that is, this fall.

All distance education consumers, whether they are big or small, are hurt and diminished by the failure to have equal access to more and more classrooms.

Senator ROCKEFELLER. Ms. Weinstein, if you could sum up. Because I have your testimony right in front of me.

Ms. WEINSTEIN. The communications satellite of 1962 and subsequent explosion of space- and land-based technologies brought about cable satellites, voice satellites, weather satellites, and direct broadcast satellites. Why should not the world's leading democracy in a global economy have an education satellite? Why should not the huge education industry receive the same economic benefits as others with access to satellites which are financially and operationally structured to meet the needs and demands of the market?

If I might just sum up by telling you that the telecommunications industry are in a new age. We can all agree on that. They are the transportation industry of a global information economy, and we can feel certain that an education satellite will lead greatly to an equitable and modern-day U.S. educational system.

If I can, Senator, I would tell you that we represent in many ways the users that you heard from this morning. The key points that they addressed are the points of the education sector—and that deals with interconnectivity and interoperability, flexibility, access to multiple systems. If we look at how we created our commercial sectors, we put together space- and land-based, interconnected them, and made sure that we had an open highway system in technology, whether it was the agricultural or the industrial age. We are now in the information age and we need a space- and land-based system that is an open, accessible highway, not more toll roads.

[The prepared statements of Ms. Weinstein follows:]

Presentation by:

Shelly Weinstein, President & CEO

National Education Telecommunications Organization

and

EDSAT Institute

Testimony

Senate Committee

on

Commerce, Science and Transportation

and

Space Subcommittee Hearing

on

Distance Learning

April 24, 1996
Russell Senate Office Building
Washington, D.C. 20510

National Education Telecommunications Organization/Education Satellite
1735 I Street, N.W. Suite 601 Washington, DC 20006 202-293-4211 voice 202-293-4210 fax 800-220-1235 toll free

Good Morning,

My name is Shelly Weinstein and I am the President of the National Education Telecommunications Organization (NETO) and the EDSAT Institute (EDSAT). NETO/EDSAT is a non-profit, non-government "education users organization" established to govern and manage affordable and equitable satellite and other land-based telecommunications services on behalf of America's education institutions, governments and other distant learning centers.

Our members, located in more than 35 states, include school districts, colleges, state agencies, libraries, public/private education consortia, private sector representatives and individuals. The goal is to create an integrated, nationwide telecommunications system--a "transparent seamless highway"--that encompasses land and space, over which teaching, training and other educational resources can be delivered to schools, colleges, universities, libraries, government agencies, and the workplace.

NETO/EDSAT's mission is to help open access to and the use of end-user information tools in formal school settings and classrooms nationwide (and ultimately, internationally) such as telephones, computers, faxes, video cameras, and/or television sets.

An objective is to give every school unlimited access to a interconnected multi-technology transportation system that carries teaching, instruction and information in all forms--video, voice and date--from almost anywhere in the nation or world.

Technology has rapidly transformed every sector of our society except education. Although telecommunications has turned the world into a "global village," America's schools for the most part have remained relatively isolated enterprises. While the educational resources available in this nation and around the globe are rich and growing exponentially, the United States is without technologically integrated telecommunications infrastructures to "transport" major products and services of an information economy, i.e., instruction, education, training and information.

A nation's education systems are endemic to economic development and productivity. We also know that growth and productivity are closely tied to the level of telecommunications "use" in industrial and developing nations. In testimony before the Subcommittee on Technology and Competitiveness, House Committee on Science, Space and Technology (June 18, 1991), the U.S. Chamber of Commerce pointed out that the U.S. invests:

> "only about $100 per student in education in ... capital investment compared to $50,000 per worker in private industry and $100,000 per worker in high tech firms."

If one applied an international measure to America's telecommunications infrastructure dedicated to education, the U.S. education sector's use of telecommunications roughly compares to that of a developing nation.

The EDSAT Institute's report in 1991, "Analysis of a Proposal for an Education Satellite", found that individual states and educational institutions are investing heavily in telecommunications technology. The technologies through which instruction is delivered at the local level includes copper wire and fiber, co-axial cable, microwave and fixed-based broadcast television as well as receivers for satellite transmission. All land-based technologies are essential to an interconnected electronic infrastructure and satellites are the most cost-effective means by which to distribute multiple education programs, simultaneously to every part of a state and the nation, at relatively low unit cost.

The market to support an education satellite and other telecommunications already exists. There are more than 200 small education program providers using satellite-based telecommunications to deliver instructional programming into classrooms and workplaces. Educators spend approximately $500 million annually on distance education with approximately 1/3 of the costs for satellite time.

More than 90 U.S. colleges and universities deliver degree, non-degree, graduate and undergraduate courses through satellite, telephone and cable transmissions. They use more than 100,000 hours of satellite time and reach millions of students, teachers and workers domestically and internationally.

In its totality the education sector has the potential to be the biggest user of telecommunications comparable to, if not greater than, the commercial sector. Despite this high level of use the U.S. has not created an affordable, accessible and equitable transmission highway governed by market demand and need, dedicated to transport instruction, information, education, and teaching--an I-95 of education.

The U.S. economy has always benefited through its worldclass transportation infrastructures. U.S. transportation systems have been effective and economical when they provide access to increasingly greater numbers of users; when the primary system interconnects through multiple secondary and access systems with user friendly maps, tools and standards. Armed with this knowledge the U.S. economy still asks small and large education providers to use commercial toll highways designed for broadcast, voice and data, with exclusivity, limited and preemptible access and preferential pricing based on quantity, distance and bandwidth.

These models are more often than not incompatible with the education market demands and needs. The broadcast and voice transmission models are less than conducive, if not barriers to establish a space-based transportation system to deliver cost-effective products and services adequate for teaching and learning tools.

The satellite business has grown exponentially over the years because it has responded to the needs and demands of targeted large markets. The satellite industry has compatible financial structures and business policies to meet their user demands and needs. As a result, this nation has 'cable' satellites, 'voice' satellites, 'military' satellites, 'direct broadcast' satellites, 'weather' satellites, and apparently 'National Recognizance Organization' (CIA) satellites.

Why shouldn't the world's leading democracy in a global economy, i.e. the U.S., have an education satellite? Why shouldn't the huge education industry receive the same economic benefits as other industries when they need their own satellites? After all, the education sector pays its own way. Collectively schools, colleges and states are big buyers. This can be seen by the growth in the use of telecommunications in education. It has been nothing short of phenomenal, costly and chaotic over the last ten years. Access and use of telecommunications in teaching and learning is fragmented, disorganized and for the most part underutilized in classrooms.

- Taxpayers, governors, students and teachers are not getting much bang for their buck with disorganized and fragmented spending.

- Educators spend $500 million annually on distance education. It is expected to exceed $2 billion by the late 1990's.

- Over 90 US colleges offer degree, non-degree, graduate & undergraduate courses through distance education with access to approximately over one and a half a million students.

- Approximately 50% of 16,000 school districts receive instruction through technology, and of these school districts, 48%receive from a satellite dish and 26% receive the signal off satellites through cable. In the last three years, satellite dish ownership grew greatest in rural and urban areas.

- In 1984 US schools had one computer per 200 pupils. In 1994 there was one computer for every 5 - 6 pupils. Additionally, few school budgets take into account the costs for local and long distance calls.

- There are more than 11 federal agencies delivering education and training through Video Teletraining (VTT) Networks.

- Roughly 200 education program providers deliver education, instruction and training through access to classrooms and workplaces. These program providers are colleges, school districts, state agencies and others education consortia.

- The U.S. has 57 minority Education and Training Networks in healthcare, government services, education and military training.

- The US Department of Defense spent more than $25 million to install 450 receive sites for six DOD/Services Education Networks, not including the operating and audio (long distance) costs.

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However, many of the 200 education providers offering curriculum and interactive instruction in this field, known as distance education, are at risk. Distance education began to offer a bright light at the end of the tunnel about ten years ago for millions of students and teachers by giving them access to math, science, languages, technologies, research and teacher training which would otherwise not be available due to geography, wealth and population density. The distance education promise has been temporarily dimmed due to shortages and unstable price increases in the satellite industry. (APPENDIX "A")

NETO/EDSAT points out that there are few, if any alternatives to satellite services for institutions with limited education budgets. Fiber lines are no answer because it landlocks students' access to teachers and educational resources and it is too costly to operate for multiple classroom use for the foreseeable future. (APPENDIX "B") Cable or copper lines offer the local link or connection into the classrooms, the last mile. Satellite offers a cost-effective instant interactive nationwide highway. As some would say, "launch a satellite and our school children have an instant highway to educational riches".

U.S. schools are frequently described as "low-tech" in a "high-tech" society. This belies the interrelationship between the U.S. education systems, its economy and well being of society. U.S. schools are, at best, in a high-tech society with infrastructure which is largely comparable to those of a developing nation's.

There are strong indications that many developing regions such as the Pacific Rim, the Caribbean and Eastern European Countries that are striving to balance economic development, democracy and political stability, may likely outpace the technological capabilities of US schools within the next 8 to 10 years. Where is that likely to leave future U.S. leadership and economy?

What technical aspects are needed to sustain the large and small education programmers and encourage new growth along with cultural and ethnic program diversity? Education users need state of the art, multi-technologies which interconnect nationwide and are interoperable over satellite, cable and telephone lines directly into classrooms, workplaces and distant education centers through friendly end-user tools, computers, telephones, faxes, television and video cameras.

There are far too many school districts out of 16,000 that cannot demonstrate an exemplary information project. Is it Congress' role to develop more "projects", regional or local? The time has come for Congress and states to develop a nationwide vision, strategy and tactics with plans, maps and standards to encourage access to our vast educational resources and teaching expertise to preserve local identity and control and blind to geographic location or wealth of the community. Parents and students expect their educational institutions to provide an equitable educational opportunity suitable to meet the rigors and demands of a global information age economy, its workplaces, its workers, their family and community responsibilities.

The education sector has unique and discreet practices; it has a public interest mission; and it is endemic to national economic security. The education users; our communities, parents, students, and the private sector must control their own destiny through inclusive policies, equity in pricing and open access to encourage more, not less choice.

There is a key role for industry and technology. Governors and educators have a role and the federal government has a role. Together the three sectors form a force far larger than the sum of their parts.

NETO/EDSAT congratulates Senator Conrad Burns (Montana), Congresswoman Constance Morella (Maryland) and Congressman George Brown, Jr. (California) on their efforts to dedicate NASA's unused TDRSS 6 satellite C-Band capacity for schools throughout the nation, as a response to the immediate crisis facing education users who are likely to lose business, become destabilized and underutilized by September of 1996 because of satellite shortages and high pricing

Historically NASA has made use of its satellites outside its programs to encourage and help small commercial firms use space for greater economic benefits. A timely dedication of NASA's unused C-Band satellite capacity for prime-use by the education sector will help NASA reach its goals and greatly benefit students and teachers, nationwide.

For the long term, NETO/EDSAT supports Senator Conrad Burns', Congresswoman Morella's and Ranking Minority Member George Brown, Jr.'s education satellite loan guarantee program, SB1278 and HR1908, to minimize the risks for private sector investors and establish an adequate satellite system dedicated to education.

The U.S. is well into an information era absent a transportation system for educational institutions to deliver and use the major products, services and human resources of an information economy, i.e., education, instruction, training and information!

Imagine if you will, former President Dwight Eisenhower telling this nation he would build a highway, coast-to-coast, to give American families access to job opportunities, education, housing and other social benefits to far exceed their greatest dreams and expectations. Then tell the governors to build their state and local area highway systems while hoping that industries' promises and engineers will somehow make it all connect! You and I know it didn't happen that way for this nation's Interstate highway systems whether by rail or auto and it won't happen that way for an Interstate education electronic highway system.

Industry leaders who support NETO/EDSAT's mission and efforts to establish an education satellite include AT&T SKYNet Satellite Systems, Discovery Communications, Westinghouse Communications, Westinghouse Electric Foundation, Orion Network Systems, American Community Services Network (ACSN /Psaras, Inc. Fund), Southern New England Telephone Company and others. Additional support is received from school districts, state and federal agencies, public and private colleges, public and private colleges and university systems in more than 35 states along with nationwide and regional education organizations. Many federal agencies work with and seek NETO/EDSAT's services.

Materials/Appendices with Testimony

Appendix A-------------	Letters of Support
Appendix "B"...............	NETO/EDSAT Media Advisory Package Sept/Oct 1995 Advisory March 1995 Advisory
Appendix "C"...............	Article: Sept 1995 Communications Industries Report: "North Carolina Superhighway in Slow Gear" Article: August, 1995 Via Satellite: "The U.S. Capacity Shortage"
Appendix "D"...............	NETO/EDSAT Background Package Overview Policies & Purposes Members

APPENDIX "A"

CONRAD BURNS
MONTANA

United States Senate
WASHINGTON, DC 20510–2603

COMMITTEES:
APPROPRIATIONS
COMMERCE, SCIENCE, AND TRANSPORTATION
ENERGY AND NATURAL RESOURCES
SMALL BUSINESS
SPECIAL COMMITTEE ON AGING

May 24, 1995

Daniel S. Goldin
Administrator
National Aeronautics and Space Administration
Washington, D.C. 20546-0001

Dear Mr. Goldin:

We are deeply concerned about the crisis in satellite services and other telecommunications for delivery of educational information to rural areas of the United States.

There are hundreds of colleges, states, and school districts which use satellite-based telecommunications to deliver educational information to the nation's rural school districts. Unfortunately, due to the lack of satellite transponder availability, some colleges and school districts which provide programming have already cut back course offerings for the upcoming 1995 fall semester.

We believe NASA may be in a position to help offer a solution to this crisis by employing the 12 C-band transponders on the Tracking and Data Relay Satellite - TDRSS 6 for distance education. The use of TDRSS-6 would be for an interim period, not to exceed 3 years, to help eliminate the pending crisis in distance education until an adequate satellite system would be available to the educational community.

We would appreciate hearing from you about how we might dedicate the 12 C-band transponders on TDRSS-6 at the earliest possible moment.

Sincerely,

George E. Brown Jr.

Conrad Burns
United States Senator

George E. Brown, Jr.
Member of Congress

CRB/mab

CONSTANCE A. MORELLA
8TH DISTRICT, MARYLAND

WASHINGTON OFFICE
106 Cannon House Office Building
Washington, DC 20515
(202) 225-5341
Fax: (202) 225-1389

DISTRICT OFFICE
51 Monroe Street
Suite 507
Rockville, MD 20850
(301) 424-3501
Fax: (301) 424-5992

Congress of the United States
House of Representatives

COMMITTEE ON SCIENCE
SUBCOMMITTEES:
CHAIR, TECHNOLOGY
BASIC RESEARCH

COMMITTEE ON GOVERNMENT REFORM AND OVERSIGHT
SUBCOMMITTEES:
CIVIL SERVICE
HUMAN RESOURCES

CONGRESSIONAL CAUCUS FOR WOMEN'S ISSUES
CO-CHAIR

July 13, 1995

The Honorable Daniel Goldin
Administrator
National Aeronautics and
Space Administration (NASA)
400 Maryland Avenue, SW
Washington, DC 20546-0001

Dear Dr. Goldin:

I am writing to you in the hope that NASA can be of help in solving the crisis in satellite services for the delivery of educational information to rural areas of the United States. A decline in the availability of satellite capacity is putting distance learning programs across the country at risk.

Numerous colleges, states, and school districts use satellite-based telecommunications to provide education and instruction to school districts, hospitals, and family health centers in hard-to-reach areas. If we do not address the shortage in satellite capacity, these programs will be curtailed or eliminated. Unfortunately, due to the lack of satellite transponder availability, some colleges and school districts have already cut back in their course offerings for the 1995 fall semester.

NASA may be in a position to offer a solution to this crisis by employing the 12 C-band transponders on the Tracking and Data relay Satellite-TDRSS 6 for distance education. The use of TDRSS-6 would be for an interim period, not to exceed 3 years, to help eliminate the pending crisis in distance education until an adequate satellite system would be available in the educational community.

I would appreciate hearing your thoughts about how we might dedicate the 12 C-band transponders on TDRSS-6.

With best wishes,

Sincerely,

Connie Morella
Constance A. Morella
Member of Congress

CAM:sz

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STENY H. HOYER
5TH DISTRICT, MARYLAND

CO-CHAIR
DEMOCRATIC STEERING COMMITTEE

COMMISSION ON SECURITY AND
COOPERATION IN EUROPE

Congress of the United States
House of Representatives
Washington, DC 20515–2005

APPROPRIATIONS COMMITTEE

TREASURY, POSTAL SERVICE,
GENERAL GOVERNMENT

LABOR,
HEALTH AND HUMAN SERVICES,
EDUCATION

February 26, 1996

The Honorable Albert Gore
Vice President of the United States
1600 Pennsylvania Ave.
Washington DC 20500

Dear Mr. Vice President:

I am writing to seek your support for an initiative which I believe will improve access to quality educational programs in urban and rural schools. As you know, the infrastructure cost for access to technology such as satellite programming is very high. This prevents many school systems from taking advantage of available technology. The National Education Telecommunications Organization (NETO) has approached me with a proposal to expand access to distance learning programs in two ways.

More than 200 colleges and universities are faced with discontinuing their long distance learning programs in August when funds for expensive bandwidth capacity will be depleted. However, currently unused bandwidth capacity on NASA satellites could be employed to expand classroom satellite programming. I understand that NASA Administrator Golden has been consulted regarding this proposal, which would provide short-term relief until commercial satellite capacity can be expanded.

NETO informs me that private investors want to provide the capital needed to create a long-term solution to this capacity problem. However, the lack of available loan guarantees for educational, rather than commercial, endeavors has stood in the way. I would suggest the Administration propose a revolving fund to provide the loan guarantees needed for this purpose.

These measures are low-cost ways to further the President's and your goal of providing life-long learning opportunities and access to high technology, particularly for communities that can least afford them, and are also models of the public-private partnership your Administration advocates. I look forward to hearing from you on these proposals.

With warmest personal regards, I am

Sincerely yours,

Steny H. Hoyer

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Congress of the United States
Washington, DC 20515

January 22, 1996

The Honorable Daniel Goldin
Administrator
National Aeronautics and Space Administration
400 Maryland Avenue, SW
Washington, DC 20546-0001

Dear Dr. Goldin:

We would like to thank your staff for taking the time to meet with Shelly Weinstein, President/Chief Executive Officer of the National Education Telecommunications Organization/Education Satellite (NETO/EDSAT).

As you know, we have long been interested in helping to strengthen and improve the utilization of telecommunications in the U.S. economy and educational institutions. The need for a satellite dedicated to education, instruction, training and information has been apparent since the issue was raised in the 1989 education summit. Since that time, NETO/EDSAT has been working to improve the availability of educational programming for schools, colleges, libraries and other distance education centers across the country through dedicated satellite and other land-based telecommunications.

Legislation has been introduced in Congress to facilitate the development of an integrated satellite-based system linked with telephone cable lines dedicated to education, instruction, training and information. The bills, S.1278 and H.R. 1908, would establish a public/private loan guarantee program which is self-sustaining with the private-sector, NETO/EDSAT, schools and states.

Collocation of such a system will both allow schools to receive far more educational programming as well as enhance the marketing of programming, reduce technical problems, and stabilize the pricing of satellite time. Federal backing of such a system will not only enhance the educational opportunities for our children, but it will also benefit state and local educational agencies by ultimately reducing their expenses for satellite services and equipment.

Additionally, NETO/EDSAT has been pursuing these issues and is currently working on a short-term strategy to make use of NASA's TDRSS VI, C-Band transponders to immediately minimize the risk that more than 200 colleges, state agencies, school districts and private consortia are facing because of loss of transmission.

We commend you on diligently pursuing the problems of connecting America's classrooms to give all students an equitable opportunity for access and utilization of this nation's abundant educational resources, teaching skills and expertise.

Sincerely,

George E. Brown Jr

Connie Morella

Conrad Burns
U.S. Senate

George E. Brown, Jr
Member of Congress

Constance Morella
Member of Congress

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Congress of the United States
Washington, DC 20515

November 14, 1995

The Honorable Albert Gore, Jr.
Vice President
United States of America
Old Executive Office Building
Washington D.C.   20501

Dear Mr. Vice President:

We would like to thank your staff for taking the time to meet with Shelly Weinstein, President/Chief Executive Officer of the National Education Telecommunications Organization/Education Satellite (NETO/EDSAT).

As you know, we have long been interested in helping to strengthen and improve the utilization of telecommunications in the U.S. economy and educational institutions. The need for a satellite dedicated to education, instruction, training and information has been apparent since the issue was raised in the 1989 education summit. Since that time, NETO/EDSAT has been working to improve the availability of educational programming for schools, colleges, libraries and other distance education centers across the country through dedicated satellite and other land-based telecommunications.

Legislation has been introduced in Congress to facilitate the development of an integrated satellite-based system linked with telephone cable lines dedicated to education, instruction, training and information. The bill, H.R. 1808, would establish a public/private loan guarantee program which is self-sustaining with the private-sector, NETO/EDSAT, schools and states.

Collocation of such a system will both allow schools to receive far more educational programming as well as enhance the marketing of programming, reduce technical problems, and stabilize the pricing of satellite time. Federal backing of such a system will not only enhance the educational opportunities for our children, but it will also benefit state and local educational agencies by ultimately reducing their expenses for satellite services and equipment.

Additionally, NETO/EDSAT has been pursuing these issues and is currently working on a short-term strategy to make use of NASA's unused satellite transponders to immediately minimize the risk that more than 200 colleges, state agencies, school districts and private consortia are facing because of loss of transmission.

We commend you on diligently pursuing the problems of connecting America's classrooms to give all students an equitable opportunity for access and utilization of this nation's abundant educational resources, teaching skills and expertise.

Sincerely,

George E Brown Jr.
George E. Brown, Jr.
Member of Congress

Connie Morella
Constance A. Morella
Member of Congress

OKLAHOMA STATE UNIVERSITY

OSU

College of Arts & Sciences
Office of the Dean
201 Life Sciences East
Stillwater, Oklahoma 74078-3015
405-744-5663, FAX 405-744-7074

January 19, 1996

The Honorable Daniel S. Goldin
Administrator
National Aeronautics and Space Administration
300 "E" Street S.W.
Washington, D.C. 20546

Dear Mr. Goldin:

As a senior member of the distance education community and the founder of Oklahoma State University's Arts and Sciences Teleconferencing Service, the oldest provider of satellite-based educational services to K-12 schools nation-wide, I have seen the profound effect distance education has had on America's public schools. Without question there are thousands of citizens who owe the productive lives they lead today to the fact that they had access to educational programming, via satellite, that would not have otherwise been available to them in their local school.

This access is threatened. Rapidly escalating costs for transponder time threaten the continued viability of the many non-profit organizations that are providing a wide range of educational services to children and adults.

I am aware that several members of Congress have been exploring with you the possibility of acquiring excess NASA transponder capacity for educational purposes. I urge you to give serious consideration to this proposal. It is a solution which will have a profound impact on the face of education across the entire nation.

Sincerely,

Smith L. Holt

Smith L. Holt, Dean
Member, Executive Committee,
NETO/EDSAT Board

slh/ms

Bringing Dreams to Life
The Campaign for OSU

Educational
Service
District 101

1025 West Indiana Avenue
Spokane, WA 99205-4400
(509) 456-6320
SCAN: 545-6320
FAX: (509) 456-2999

December 15, 1995

The Honorable Daniel S. Goldin
Administrator
National Aeronautics and Space Administration
300 "E" Street S.W.
Washington, D.C. 20546

Dear Mr. Goldin:

Educational Service District 101 operates a satellite-based "distance learning" network which provides educational programming to more than 50,000 students in 31 states. Our network, STEP/Star, will face a possible shutdown in 1996 if we cannot acquire affordable access to satellite transponders. As a non-profit enterprise, we simply cannot afford the 700-percent rate increases we are being quoted for satellite time.

I know that several members of Congress have approached you about the possibility of acquiring excess NASA satellite capacity for educational purposes. I heartily endorse this initiative. I hope, too, that you can make a decision quickly. Time, indeed, is of the essence as the enrollment of students for Fall 1996 classes will begin in February 1996.

It is no exaggeration to say the situation is desperate. If the satellite access/cost issue is not resolved in the next 60 days, many providers will be simply forced off the air. This will leave many of our students, particularly those in rural-remote locations, with virtually no access to education.

A partnership between education and NASA would be, in my view, mutually beneficial. Our students would receive access to a resource critical to their education and you would receive revenue from a previously untapped source. Yes, we are willing to pay for what we use.

Thank you for your consideration. Any assistance you can provide us will be deeply appreciated.

Sincerely,

B L Talbot

Brian L. Talbott, Ph.D.
Superintendent

cc: Senator Conrad Burns
Shelly Weinstein, NETO

Superintendent: Brian L. Talbott, Ph.D.
Board of Directors: Chairman, [illegible]; Vice Chairman, J. Leigh [illegible]
Members of the Board: Dr. F.L. (Fred) [illegible], [illegible], Dr. [illegible], Carl [illegible], [illegible] Schmidt.
Serving [illegible] public school districts and [illegible] state-approved private schools in:
Adams, Ferry, Lincoln, Pend Oreille, Spokane, Stevens and Whitman counties.
Educational Service District 101 is an equal opportunity/affirmative action employer.

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James Pagliasotti, Executive Director, 130 State Capitol, Denver, CO 80203
Phone 303/866-2087 Fax 303/866-5469

AEROSPACE STATES
ASSOCIATION

March 16, 1995

Honorable Conrad Burns
United States Senate
Dirksen Senate Office Building
Washington, D.C. 20510

Dear Senator Burns:

On behalf of Lt. Governor Gail Schoettler of Colorado, Chair of the Aerospace States Association (ASA) and its governor-appointed delegates from 34 member states, I am writing to express our support for a fully interoperable telecommunications system dedicated to education, instruction and training that utilizes satellite-based linkage to terrestrial infrastructure.

As an educational organization, ASA has a long held interest in the efforts of the National Education Telecommunications Organization (NETO), which works to enhance equitable access to educational opportunities for all Americans through a dedicated educational satellite.

We concur with NETO that the current shortage of transponder capacity and high cost of access threatens the ability of America's education entrepreneurs—its colleges, school districts and state agencies—to deliver distance education to a citizenry sorely in need of its services. The distance education industry serves virtually all of our nation's 16,000 school districts. 86 U.S. colleges and universities deliver course work and training at all levels to sites throughout the country and the world. Educators currently spend some $500 million annually on distance education and project that spending will grow to more than $2 billion by the end of the century.

The magnitude of demand for distance education and its critical importance to the well-being of our nation suggests that equitable, reliable and affordable access to satellite-based delivery systems is crucial. Utilization of excess government transponder capacity may be a near-term solution, but ultimately a reallocation of educational monies to establish a satellite dedicated to the education, instruction and training might best serve the American people.

Sincerely,

James Pagliasotti
Executive Director

United States Senate
COMMITTEE ON ARMED SERVICES
WASHINGTON, DC 20510-6050

August 8, 1995

Ms. Shelly Weinstein
President/CEO
NETO/EDSAT
1735 I Street N.W., Suite 601
Washington, District of Columbia 20006

Dear Ms Weinstein:

Attached is a copy of the report I recently received from the Department of Defense in response to my inquiry in your behalf.

I hope the information in this report is helpful in responding to your concerns.

If you believe I may be of further assistance with this or any other federal matter, please let me know.

Sincerely,

Sam Nunn
Sam Nunn

Enclosure

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DEFENSE INFORMATION SYSTEMS AGENCY
701 S. COURT HOUSE ROAD
ARLINGTON, VA 22204-2199

2 December 1994

C4I Modeling, Simulation and Assessment Directorate

Honorable Sam Nunn
Chairman, Armed Services Committee
United States Senate
Washington, 20510

Dear Mr. Chairman:

This is in response to the letter to you from Ms Shelly Weinstein, President and CEO of the National Education Telecommunications Organization/Education Satellite (NETO/EDSAT). DISA is unable to accommodate NETO/EDSAT's request for use of military satellite transponders. DoD satellites, in both domestic and international orbital locations, are over subscribed, supporting a host of troop deployments and other commitments worldwide. Ms Weinstein makes the comment that we "seek ideas to convert military hardware and research to benefit commerce." While the end of the cold war makes that possible in some areas, the need for DoD satellite communications has not diminished. The requirement to maintain the same level of readiness, as well as a more up-tempo deployment schedule for contingencies around the world (Kuwait, Haiti, Somalia, Bosnia, etc.) supported by fewer forward-deployed facilities, increases DoD's reliance on its scarce communications capability.

The DISA is embarking on a Congressionally directed program to consolidate DoD's requirements on commercial satellites to supplement military satellites where possible. The DoD also has requirements, similar to Ms Weinstein's, for domestic training and education purposes. Since those requirements are admittedly of a lower priority than supporting deployed forces, they are allocated to commercial satellite communications and fiber networks. We face the same difficulties as the private sector. I suggest that Ms Weinstein contact NASA, which has spare commercial-band capacity on their TDRSS satellites.

Sincerely,

Albert J Edmonds

ALBERT J. EDMONDS
Lieutenant General, USAF
Director

ASSISTANT SECRETARY OF DEFENSE

6000 DEFENSE PENTAGON
WASHINGTON, DC 20301-6000

June 14, 1995

Honorable Sam Nunn
Committee on Armed Services
United States Senate
Washington, DC 20510

Dear Senator Nunn:

This is in response to your letter of April 27, 1995, asking for a review of the concerns of Ms. Shelly Weinstein, President and CEO of the National Education Telecommunications Organization/Education Satellite. Ms. Weinstein requests the use of military satellite transponders to meet educational distance learning requirements.

We have reassessed the availability of military satellite capacity in light of Ms. Weinstein's request. As with our initial analysis (enclosed), recent assessments reaffirm that our military satellites will continue to be oversubscribed for the foreseeable future. As a result, lower priority military requirements will continue to be removed from our military satellites to accommodate more critical requirements which directly support the deployed warfighter. These lower priority requirements are re-allocated to the commercial satellite and fiber networks used by the Department of Defense.

The Department is unable to support Ms. Weinstein's request and recommends that Ms. Weinstein contact the National Aeronautics and Space Administration which may have spare capacity on their Tracking and Data Relay Satellite System satellites.

Sincerely,

Emmett Paige, Jr.

Emmett Paige, Jr.

Enclosure

APPENDIX "B"

MEDIA ADVISORY - SEPT/OCT 1995
FOR IMMEDIATE RELEASE

NETO/EDSAT congratulates Senator Conrad Burns (Montana), Congresswoman Constance Morella (Maryland) and Congressman George Brown, Jr. (California) on their efforts to dedicate NASA's unused satellite capacity for schools throughout the nation, as a response to an immediate crisis facing school programmers who are likely to go dark by September of 1996 because of unexpected shortages in satellite capacity and the accompanying skyrocketing price increases.

Burns, Morella and Brown have gained national recognition for their leadership in helping to open access and the use of telecommunications in U.S. classrooms in recent years. The long-term focus is on loan guarantees to encourage a public/private partnership to establish an adequate satellite system interconnected with other telecommunications dedicated to students, teachers and workers for instruction, training and education. And, for a limited period make NASA's unused Inflite C-Band satellite transponders available to schools, colleges, states, libraries and other education centers as the prime users.

David Taylor, NETO Chairman and Dean, Western Illinois University, College of Education and Human Resources states, "NETO/EDSAT is pleased at the positive reactions and cooperation NETO/EDSAT has received from satellite industry leaders. Many persons in the satellite industry have education customers and know they are unable to meet their needs due to the shortages and price increases. Industry leaders view NASA's dedication of the unused capacity as a positive temporary step to keep small education users in business and ultimately to create an education satellite with loan guarantees."

The infant U.S. distance education field is at risk. It began to offer a bright light at the end of the tunnel about ten years ago for millions of students and teachers to gain access to math, science, languages, technologies, research and teacher training. Its promise has been temporarily dimmed due to the shortages and price increases in the satellite industry.

The satellite business has grown exponentially over the years because it has responded to the needs and demands of targeted large markets, with financial and business policies which are compatible with how the user does business. "As a result, this nation has 'cable' satellites, 'voice' satellites, 'military' satellites, 'direct broadcast' satellites, 'weather' satellites, and apparently 'National Recognizance Organization' (CIA) satellites," states Shelly Weinstein, President & CEO, NETO/EDSAT.

National Education Telecommunications Organization/Education Satellite
1735 I Street, N.W. Suite 601 Washington, DC 20006 202-293-4211 voice 202-293-4210 fax 800-220-1235 toll free

Weinstein asks, "Why shouldn't the world's leading democracy in a global economy, i.e. the U.S., have an education satellite? Why shouldn't the huge education industry receive the same economic benefits as other industries when they need their own satellites? After all, the education sector pays its own way. Schools, colleges and states spend about $500 million annually, on distance education about a third of which is spent to buy satellite time. Collectively, they're a big buyer by any stretch of the imagination. NETO/EDSAT regrets NASA's delay in dedicating this capacity to education."

NETO/EDSAT points out that there are few if any alternatives to satellite for institutions with limited education budgets. Fiber lines are no answer because it landlocks students' access to teachers and educational resources and it is too costly to operate for multiple classroom use for the foreseeable future. Cable or copper lines offer the local link or connection into the classrooms. Satellite offers a cost-effective instant interactive nationwide highway. NASA will not incur any costs upon the dedication of this capacity to education as the prime user. It will be of great benefit to U.S. taxpayers and their schools to make use of this unused power currently going to waste.

Historically NASA has made use of its satellites outside their programs to encourage and help small commercial firms make use of space for greater economic benefits. A timely NASA decision to dedicate the unused C-Band satellite capacity for prime-use by small education organizations will help NASA reach its goals and greatly benefit students and teachers, nationwide.

The National Education Telecommunications Organization (NETO/EDSAT) is an independent Washington based, not-for-profit organization established to improve and reform American education through the use of an integrated nationwide satellite-based telecommunications system linked with cable and telephone lines dedicated to education, instruction and training. NETO/EDSAT members include school districts, state agencies, colleges and private sector programmers who use telecommunications technologies to receive and send education, instruction and training. NETO/EDSAT is supported through government contracts, corporate and individual contributions.

For further information on NETO/EDSAT contact Shelly Weinstein at 1-800-220-1235 or FAX 202-293-4210. You may also want to contact your Congressional representatives through their e-mail address. This press release can be found on the Internet at (http://www.fortecom.com/neto.html).

MEDIA ADVISORY

MARCH 1995

NETO/EDSAT WARNS OF CRISIS IN UNITED STATES DISTANCE EDUCATION

FOR IMMEDIATE RELEASE:

The National Education Telecommunications Organization and EDSAT (NETO/EDSAT) warn of a fast oncoming telecommunications crisis which will put small education entrepreneurs out of business! Hundreds of colleges, school districts and state agencies deliver teaching and education resources to tens of thousands of classrooms and workplaces.

"An unexpected, critical shortage and increased costs of satellite transponder capacity will force many, many small independent education providers to go dark and out of business," said Shelly Weinstein, President & CEO of NETO/EDSAT.

Hundreds of colleges, school districts and private corporations deliver live interactive courses with instruction, using more than a hundred thousand hours of satellite time. It's enough hours to fill up almost 40% to 50% of a large geosynchronous satellite but occasional education buyers are spread out over half the in-flite domestic satellites.

Dr. Smith Holt, Dean, College of Arts & Sciences, Oklahoma State University and NETO/EDSAT Board member, points out that "unfortunately a massive erosion of the availability of transponder space and a major escalation in its costs are occurring. This unanticipated shortage was caused by launch failures, underestimating demand and overestimating market shifts in technology. The effect is that some education providers have already cut-back course offerings for the 1995 Fall Semester, while others are predicting loss of viability within eighteen months should remedies not be enacted".

more

Educators spend almost $500 million annually just on Distance Education, the delivery of courseware and teaching, at all education levels (K-12, degree, non-degree programs, etc.). Spending is projected to reach more than $2 billion within the last half of the 90's. States and school districts spend public tax dollars on satellite, cable, telephone, ITFS, microwave and satellite dishes to deliver educational resources, cost-effectively. "They cannot be limited by or change to a single transmission system without incurring massive additional costs", says Weinstein.

NETO/EDSAT believes that educators should have equitable access and utilization of cost-effective interconnected multiple technologies to let teachers and students have user-friendly tools in classroom settings.

For the short-term NETO/EDSAT is seeking access to unused government owned satellites. For the long-term Congress must provide a no-loss loan guarantee program for the private sector to create a satellite interconnected with land-based, telephone and cable systems, dedicated to education. AN ELECTRONIC INTERSTATE HIGHWAY SYSTEM FOR EDUCATION, INSTRUCTION AND TRAINING FOR THE TWENTY FIRST CENTURY!

The National Education Telecommunications Organization (NETO/EDSAT) is a Washington based, not-for-profit organization created to improve and reform American education through the use of an integrated nationwide satellite-based telecommunications system linked with cable and telephone lines dedicated to education, instruction and training. NETO/EDSAT members include school districts, state agencies, colleges and private sector programmers who use telecommunications technologies to receive and send education, instruction and training. NETO/EDSAT is supported through government contracts, corporate and individual contributions.

- end

March 1995

THE TRANSPONDER CRISIS

The distance education industry in the United States serves virtually all of the nation's 16,000 school districts, providing access to coursework otherwise unavailable to students (e.g. advanced mathematics and science, foreign languages, remedial reading and enrichment programming), in-service for teachers, training for administrators, as well as a host of other vital services. These services are in jeopardy!

In order to reach the schools in America, the universities, school districts, and private corporations that originate satellite programming consume between 85,000 and 100,000 hours of transponder time. Given the magnitude of the demand, access to satellite time at an affordable cost is crucial if the industry is to perform its vital function. Unfortunately a massive erosion of the availability of transponder space and a major escalation in its costs is occurring. The following are the facts.

The availability of C-Band transmission time has reached a near critical shortage.

- **Changes were caused by the failure of Telstar 402 in September 1994.**
- **As of January 1, 1995 the only C-Band satellites with occasional space are Satcom C1, Galaxy 3, Telstar 302 and Telstar 303.**
- **Many transponders once used for occasional time have been leased full time by networks or other private companies to ensure their programming has delivery space. It has been publicly announced that one major cable company just leased the remaining 17 transponders on a Hughes satellite to protect its delivery space.)**
- **Between October 1994 and year-end 1995 there will have been a 16% reduction in C-Band capacity.**

In the recent past, transponder time could be purchased up to six months in advance.

- **Now, AT&T books only 4 months in advance and Hughes only 3. AT&T has a minimum 25% cancellation fee. (In the past there were no charges unless canceled within thirty days of the broadcast.)**
- **AT&T no longer books on inquiry or allows flexible end times (approximate ends), all time must be booked firm.**

THE TRANSPONDER CRISIS (continued)

Until the shortage, C-Band time could usually be found with one or two phone calls from the broker.

- Now seven to nine calls to find the space for occasional feed.
- In some cases confirmation comes one or two weeks prior to the broadcast. (One result is that this eliminates the option to exercise the "30 day cancellation")

The other significant change is pricing.

- Individual satellites and transponders now brokered at different rates.
- Three price increases since July 1, 1994 with more expected. (Time that could be had at $130/hr before July 1, 1994 now costs upward of $350/hr).

KU-Band has seen changes due to the shortages.

- C-Band or KU-Band is fungible in the commercial sector, therefore though KU-Band space is currently available, that availability is rapidly dwindling. As a result brokers are less and less willing to provide transponder time to the "occasional" education buyer but prefer to wait for a major commercial purchaser.
- One of the largest changes occurred when GE Americom purchased all of the GTE satellites and refused to honor any existing contracts. This has driving the pricing on satellites such as the G-Star series up to $600 or $700 per hour.

The changing transponder scene has already had an effect on the education provider. Announcements were made in February 1995 that some providers would be cutting back their curriculum/course offerings beginning the fall semester of 1995. Others are predicting loss of viability within 18 months should remedies not be enacted. The bottom line is that the distance education industry, which relies on fees from schools, cannot compete with the commercial operators, whose revenues are advertiser driven.

There are two solutions to the problem -- one short-term and one long-term. The short-term solution is to provide education providers access to excess governmental capacity, e.g. military satellites. The long-term solution that seems most fiscally responsible is a government loan guarantee for a dedicated education satellite which would be governed and operated by the distance learning providers. Only with such sweeping actions can equal access to education be guaranteed to all of America's citizens.

THE CHRONICLE
of Higher Education.
March 17, 1995 • [illegible]
Volume XLI Number [illegible]

Steep Increase in Satellite Costs Concerns Colleges

By Thomas J. DeLoughry

COLLEGE OFFICIALS involved in distance education warned last week that sharp increases in the cost of satellite time could force them to cancel some courses.

The alert comes at a time when many institutions are considering greater use of distance-learning programs to reach children in schools and adults in community centers and other locations. On some campuses, the efforts have been viewed as less-expensive alternatives to constructing additional classrooms and dormitories.

The cost of satellite time has more than doubled in the last year. Educators and others familiar with the satellite industry say demands for the time have increased among broadcasters, cable companies, and other buyers while the number of devices in orbit has decreased.

TIME IS SCARCE

Even those who are willing to pay the higher prices have difficulty finding time to purchase, as the commercial customers snap it up under long-term contracts.

Groups representing educators involved in distance learning want Congress to authorize the federal government to resell its unused satellite time to schools and colleges. The organizations also want the government to back an effort to launch a satellite that would be dedicated to educational use.

"This is not crying wolf," says Anne Raymond Savage, associate vice-president for academic affairs at Old Dominion University. The price that her university pays for time on a particular type of satellite, known as C band, has risen in the last year to $443 an hour from $186.

Ms. Savage met last week with Old Dominion's provost and engineering dean to discuss the impact of the cost on distance-education programs. "We may have to cut back on the number of engineering courses we offer through that technology," she says.

'DESPERATE CALLS'

The National Education Telecommunications Organization describes the situation as a "crisis." Shelly Weinstein, the group's president, says that owners and users of satellites had predicted the price and shortage problems for several years, but that no one believed they would occur so quickly. Fast-rising demand for time among companies and the failure of a satellite launched in the fall brought things to a head, she says.

"We are getting more and more desperate calls," says Ms. Weinstein, who is also president of EDSAT, a company that helps educators use satellites. "I don't know what we're going to do for them for September of 1995."

The problem has emerged at a time when the Clinton Administration and Congress have focused a good deal of attention on facilitating the growth of data networks—made up of fiber-optic cable—that may someday link homes, schools, and colleges. Educators involved in distance education say such networks will not reach many students for decades and may never be appropriate for connecting with hundreds of locations simultaneously, as can be done with satellites.

Rising costs are not plaguing all distance-learning programs. National Technological University, for example, is such a large user of satellites that it has a 12-year contract for a portion of a satellite, known as a transponder. Officials there say the contract insulates the university from price increases.

The higher costs pose the biggest problem for "occasional users," which include colleges that need small numbers of hours each week to transmit their courses. Colleges that use the C band, an old technology that requires large satellite dishes, have seen the biggest rise in prices, because very few satellites carry C-band signals.

Brokers who buy time on satellites for their customers confirm that it is tremendously difficult to find time for occasional users of all kinds, including colleges.

Grace E. Leone, president of LFC Startime Inc. of Los Angeles, says educators must share some of the blame for the troubles they are encountering. Many institutions, she notes, have failed to keep their satellite equipment up to date and therefore cannot benefit from cost-saving advances, like digital compression, that enable a broadcaster to use less space on a satellite.

'THEY HAVE TO GET SMART'

Ms. Leone says educators also have not developed consortia that could purchase transponders and then divide the time on them among members. Instead, she says, many individual colleges are in the market trying to buy three hours a week to teach French classes that are nearly identical.

"They cut each other's throats," says Ms. Leone. "They have to get smart and look at this from a businesslike point of view and realize that in unity there is strength."

Ms. Weinstein of the educators' group says that schools and colleges have not had the money to invest in new equipment. Some institutions have formed consortia, she says, but duplicate courses will never be eliminated because of competition among educators and a desire among course recipients for choices.

The solution, Ms. Weinstein says, is not to change the behavior of educators, but to designate a satellite for their use. Her group favors the passage of legislation being prepared by Sen. Conrad Burns, Republican of Montana, that would provide federal loan guarantees to companies that build and launch a satellite dedicated to non-profit use. ■

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(Communications Daily!!)

C-BAND CAPACITY SHORTAGE HITS EDUCATORS, SENDS BROADCASTERS TOWARD FIBER

Many independent educational TV service providers will go out of business because of shortage of domestic C-band capacity and increasing costs of leasing transponders, said Shelly Weinstein, pres.-CEO, National Education Telecommunications Organization and Edsat. For short-term solution, she said, unused capacity that Defense Dept. has leased on commercial satellites could be released to educators at low cost. For long-term solution, she said, Congress should arrange for Commerce Dept. to provide loan guarantee to operator of education-dedicated satellite. She said educators currently spend $400-$500 million per year on transponder fees, and that could approach $2 billion by end of 1990s. "This is not a subsidy; it will pay for itself," she said. "A satellite dedicated to the education market – after 5 to 7 years – would be self-sustaining."

It's difficult for education community to compete with commercial interests for scarce transponder time, Weinstein said, because TV, cable and telephone industries can pay higher fees up front for carriage agreements. Often, she said, educators find their programs preempted because they couldn't afford highest nonpreemptible rates. She said educators can't pay for services in advance, as can private interests. There are 3 reasons educators need their own satellite, Weinstein said: (1) Lower costs. Instead of allowing commercial operators to profit, educators' money could be recycled into their own programs. (2) Equity. Currently educators use either equity-free leases or reseller services, have none of rights of ownership. (3) Stability. Difference in financial abilities and rules of commercial and educational communities leads to preemption.

Proposal has been introduced in previous Congresses by Reps. Morella (R-Md.) and Brown (D-Cal.) to establish education-dedicated satellite by providing loan guarantees for its operation. However, proposal was referred to Education Committees and wasn't attached to bill that passed. Morella aide said proposal could be resubmitted this year. Under last plan, Edsat would be operator of satellite, with responsibilities for raising capital, getting FCC licenses, booking transponders, etc., aide said. Weinstein told us she's still interested in assuming that role: "Our organization can provide low-cost services. [Operator] should be a body that represents the users and providers."

Broadcasters also feel pinch of C-band shortage. Speaking at recent Satellite '95 conference in Washington, Robert Zitter, HBO senior vp-technical operations, said transponder costs haven't dropped but cost of fiber is falling to point of being "nonissue." He warned that if satellites don't increase capacity and reduce costs, they "will be priced out of the market." Brent Stranathan, CBS vp-broadcast distribution, said C-band "crunch" is adding to difficulties in choosing compression technique. He said CBS is "disappointed in the development and speed of compression... MPEG-2 isn't ready, and we may have to look to a higher standard because MPEG-2 may not be good enough." However, he said, inadequate C-band capacity is driving industry for quick solution. Compression will allow more channels in same bandwidth. He agreed that "price is going to be an issue" when comparing satellite with fiber. CBS is looking at fiber feed for coverage of 1998 Olympics in Japan, he said. Other main concern of HBO's Zitter isn't in U.S., but in Asia, where he said orbital congestion and lack of teeth in ITU rules are causing serious problems. Orbital situation, he said, "is unsettling to the equilibrium of the satellite industry, making it ve difficult for investors to invest with some measure of certainty."

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video timeshare services

HUGHES
COMMUNICATIONS
A unit of GM Hughes Electronics

CUSTOMER ALERT

VTS PRICES & POLICY - EFFECTIVE JULY 1, 1995

Users of occasional video may obtain capacity, subject to availability, by contacting Video Timeshare Service (VTS) at (800) 824-8133. Occasional video shall be considered as one transmission per transponder (i.e. one analog signal per transponder or one compressed digital video carrier per transponder). Any use of VTS inventory shall be limited to one transmission per transponder and must comply with the specifications outlined in Galaxy® Satellite Services' "*Uplink Access Requirements*" guide. Any deviation from these specifications must be pre-authorized by Hughes Communications Galaxy, Inc. (HCG), such authorization to be granted at HCG's sole discretion.

RATE CARD: VTS capacity, as available, may be purchased on a flat rate per hour basis: C-band or Ku-band $1,000/hour.

MINIMUM USE: 15-minute increments (four-minute grace period)

APPROXIMATE END TIMES: A maximum approximate end time of 15-minutes may be granted at HCG's sole discretion. Feeds with approximate end times that are no shows or are not "goodnighted" will be billed to include any approximate end time scheduled.

SET UP: No "set up" time is guaranteed, however, HCI will make an effort to schedule feeds with a minimum of 5-minutes between feeds. REFER TO "*UPLINK ACCESS REQUIREMENTS*" GUIDE FOR MANDATORY ACCESS PROCEDURES.

INQUIRY: Feeds may be inquired outside of three days prior to air. Our automated reservation system deletes all inquiries within three days of event.

CHALLENGE: Inquired feeds may be "challenged" and must be firmed or released by the next business day. An inquiry "firmed on challenge" or a feed "bought on challenge" may not be shortened or cancelled.

NO SHOW: Feeds that are not used are billed at 100% of the time reserved including any approximate end time scheduled.

CANCELLATION POLICY: A firm feed may not be shortened or changed back to inquiry status. A firm feed that is cancelled within 14-days of the event will be billed at 100% of the time reserved including any approximate end time scheduled. Feeds cancelled outside 14-days of the event will be billed at 50% of the time reserved including any approximate end time scheduled.

PREEMPTIBILITY: Occasional capacity is subject to immediate preemption in case of technical/ catastrophic failure or with 30-days notice for business preemption.

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Hughes Communications, Inc. P.O. Box 92424 Los Angeles, CA 90009 Phone: (800) 824-8133

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APPENDIX "C"

The Official Publication of the International Communications Industries Association published by The Atwood Group Vol 12, No 9 SEPTEMBER 1995

COMMUNICATIONS
INDUSTRIES REPORT

ILLUSTRATION BY LINDA [illegible]

SUPERHIGHWAY

North Carolina Superhighway in Slow Gear

The North Carolina Information Highway (NCIH) detours while legislators take time out to study the most efficient use of ATM switching and to revise the way rates are set for video vs. data services.

By Dick Larsen

Washington, DC — In 1990, North Carolina began to study the feasibility of a broadband network to be built by three phone companies that would bring the state into the 21st century. In 1993, Governor James Hunt announced $4.1 million for the first stages of a "speed of light" superhighway that would eventually connect 3,300 locations such as schools, libraries, medical centers and state offices.

Since then, confusion and controversy have ruled the road.

In 1994, the General Assembly withdrew the $4.1 million, concerned about a lack of data on how sites were using funds. Instead, legislators appropriated a one-time grant of $7 million for '94-'95. And they recently approved a "Go Slow" measure that curtails additional distance learning sites by allocating $2.5 million to hook up 74 experimental sites through 1996.

An April '95 memo by the State Controller said there were "major holes" in the

See SUPERHIGHWAY, page 4

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SUPERHIGHWAY, *continued from page 1*

ability of the phone companies to "schedule, provide quality connections, resolve troubles and provide accurate billing information ... The service providers are using the state as a working model to build a production level service. The state, however, is paying for a production level service."

A Second Look at Distance Learning

Consequently, the '96 funds were earmarked mostly for government offices, medical centers and libraries that will use the NCIH's state-of-the-art ATM switching and SONET technology in order to test applications in addition to distance learning.

The reason: early on, the NCIH's rates were based on the high-end use of two-way interactive video. A distance learning site, such as a school, pays a minimum monthly fee of $4,000 for a maximum of 64 hours of usage, which includes $4,055 for intraLATA charges, $1,544 for interLATA charges and $401 for administrative overhead.

School officials believed the state would pick up a large portion, if not all, of these line charge costs. So they spent initial funds to purchase equipment needed to outfit distance learning labs.

There's concern that unless the rate structure is revised, schools won't have funds for distance learning, even though the technology is in place. Educators also are concerned about the quality of distance learning courses, getting funds to pay for distance learning training, and higher costs of programming that originates outside a school's district.

Meanwhile, a state audit of all potential users showed the "biggest potential use for NCIH sites will be for high-speed data, not video." The auditor concluded that NCIH should "reflect the bandwidth-on-demand principle and immediately develop separate rates for data-only usage for NCIH sites. Each site should be offered a menu of usage choices and should pay according to the amount and type of usage each month."

Problems Early On

Since 1993, an estimated 56 "account paying" sites — primarily schools — are using the network, built by Carolina Telephone, General Telephone and Southern Bell. It is estimated that the phone companies have installed at least four ATM switches. Initially, the project called for installation of 30 ATM switches in three years.

To some, it seemed the state bought a Rolls Royce when it may actually have needed a Volkswagen.

"We believe that two basic mistakes have been made concerning the NCIH," said a report, "North Carolina Information Highway Promises and Problems," by the Washington, DC-based Telecommunications Consulting Group Inc. "The first is not understanding the implications of the truly advanced technology that is being used in this project. The second is assuming that studies and models can be used to 'prove' assertions about the future of the NCIH, instead of relying upon evolving data from real-world experience to guide the project's future direction."

Another problem appears to be confusion about who would pay for the network. "The local schools were told the state would pay, but this didn't happen," said William Garrison, co-author of the report. "As a result of the state audit, the legislature realized that this whole question of pricing has to be re-evaluated."

Another concern, according to a General Assembly analyst who spoke with *CIR*: "You can't put a meter on ATM switching — you can't gage how much to charge for its use. This is a serious problem."

Among the report's findings:

- The regulated phone companies that are building the NCIH are allowed to set rates to recover their monthly expenses, the cost of capital investments and other one-time costs. For high schools, this can be as high as $4,000 a month. Rates and contract terms should be renegotiated with the tele phone companies. Also, the state shoul evaluate competitive procurement of som portions of the NCIH once competitors t the telephone companies can provide suc facilities.
- The grants process through which cur rent sites have been funded is lacking. Funding of sites the next three years shoul be coordinated with operational informa tion according to four application cate gories: interactive video for distanc learning; high-capacity information sys tems such as what will be required for th state's Criminal Justice Information Sy tem; university-related research, partic larly in the medical field, and requiremen for lower data-rate services.
- Early on, it was assumed that all North Carolina's telecommunications tra fic would be carried on the NCIH networ "We do not believe that all of the state's d ta and telephone networks can or shou be moved to the NCIH, either now soon," the report said.
- Fundamental questions such as "wh can the network do," and "for what can be sensibly used" are not yet fully a dressed. Because of fundamental pricir and cost questions, the General Assemb should have ongoing oversight of and pa ticipation in NCIH deployment.

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Via Satellite.

AUGUST 1995
VOLUME X, NUMBER 8

The U.S. CAPACITY SHORTAGE

The Realities of Supply and Demand Set In

by Theresa Foley

United States satellite users who thought times had gotten tough last fall, when the failure of AT&T's Telstar 402 exacerbated a severe C-band transponder shortage over the United States, found the situation getting worse halfway through 1995. To the dismay of their customers, all three U.S. satellite operators, as well as resellers, have taken advantage of the imbalance in supply and demand by raising prices steeply and suddenly.

The crunch has spread to Ku-band, still an alternative but in shorter supply than in 1994. Customers must wait until about 1998 before supply might once again exceed demand. But satellite operators appear to have changed their operating tactics to try to prevent the oversupply of transponders, accompanied by a return to lower prices, from ever happening again.

On July 1, with only about three months notice, the biggest U.S. satellite capacity vendor, Hughes Communications Inc., upped its prices, essentially doubling or quadrupling its rates for occasional-use video. Hughes is charging a flat rate of $1,000 an hour for C- or Ku-band any time of the day or night. Previously, the company sold occasional-use time for $200 to $300 an hour for non-prime time and $400 to $500 an hour for prime time, with C-band falling at the lower end of the price scale and Ku-band at the higher end. The three U.S. satellite operators no longer differentiate between prime and non-prime time use, a change that closes the door on users who tried to economize by using unpopular times to transmit. Hughes was the last to move to a flat rate price for occasional-use sales. GE Americom and AT&T were the first to drop tiered pricing and raise their fees, according to resellers. By the time Hughes had finished raising prices, the Los Angeles-based satellite giant had become the most expensive of the lot. However, resellers say GE and AT&T's cheaper prices are meaningless for now, as neither company has much capacity available to sell.

Carl Brown, Hughes Communications Inc. senior vice president for Galaxy satellite services, says transponder price increases seem dramatic because space segment rates have been disproportionately low in the past.

Some capacity is available from resellers. But, when the big operators raise prices, the resellers generally follow suit. Fifth Dimension Communications Inc. of Ottawa, a Canadian-based user and reseller of satellite time on U.S. and Canadian satellites, has capacity available, according to President Stuart Duncan. The company owns transponders on satellites belonging to Hughes, GE and AT&T. "It's like selling life preservers to people falling off the Titanic," says Duncan of the current state of reselling satellite capacity.

Grace Leone, president of EFC Startime, says her company has been reselling satellite time to occasional users for less than $500 an hour, but the price is shooting up to $800, $900 or more. EFC Startime, Los Angeles, is an independent supplier of satellite services. "Those clients who are able to will move to other carriers, but Hughes has the most capacity, so for most, there are not a lot of options," she says.

SATELLITE USERS REACT

Some customers are complaining, others are adapting. "Some are very upset and very concerned about availability. They're very displeased about the pricing structure," says Bob Patterson, president of The SpaceConnection Inc., a Los Angeles-based reseller of satellite capacity. "Everybody was aware prices would go up, but they were taken aback by the percentages they've gone up."

RE/MAX Satellite Network, Denver, is among dozens of business users affected. It began broadcasting its own programming to 1,000 franchise offices, more than 20,000 realtors, in November 1994. The satellite subscribers, who pay to lease equipment and receive the programs, represent 40 percent of RE/MAX affiliates. The programs are aimed at educating and motivating the realtors.

"The price increase is something we just have to live with. We are committed to six hours a day, five days a week of broadcasting," says Karin O'Callaghan, the network's production manager. "It will require us to do more preliminary work, like scheduling in advance. To get an advantageous price, we have to buy the time further out from when we need it."

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RE/MAX's 1,000 offices have fixed, Ku-band only dishes for encoded, digital transmission. The limited flexibility of the dishes means that the company's alternatives during a transponder shortage are also limited, O'Callaghan says. RE/MAX is shopping for its own transponder. If the network acquires one, it will resell unneeded capacity.

Edward D. Horowitz, Viacom senior vice president of technology, says that Viacom's business has not been affected by the U.S. capacity crunch. Viacom signed long-term contracts before transponders became scarce.

Edward St. Pé, chief executive officer and president of the Jackson Teleport and the National Weather Network, has been buying about two hours a day of occasional-use time on Hughes' satellites to distribute his Jackson, MS-based television weather program business for three years. He says Hughes' 90-day notice of quadrupling prices was shocking.

"It's unfortunate that a segment of the industry can arbitrarily make these kinds of changes overnight, damaging other companies. Something is out of kilter in the industry," St. Pé says. "When we went into the new year, there was no discussion of this happening. If you are going to quadruple prices, you could give a year's notice, or at least to the end of the year, but [90] days? What if the telephone company did that? I don't think they'd get away with it."

Grace Leone, president of EFC Startime, says her company has been reselling satellite time to occasional users for less than $500 an hour, but the price is shooting up to $900 or more.

St. Pé says his company is looking for alternatives to satellites, but time is short and for the kind of broad delivery needed, satellites work best.

Business television networks, some of which have tried to increase their use of satellites to counter the effect of cuts to travel budgets or other expenses, also are being hit, according to Virginia A. Ostendorf, head of a Littleton, CO-based firm that teaches companies how to provide distance learning.

"[The price increase is] no small thing. It hurts satellites' ability to be used as an alternative method of communicating and training workers at a time when companies are downsizing," she says.

Business television networks usually have dishes fixed on a certain satellite, and repointing them requires a technician to physically adjust each site, costing $125 to $225 at each location. For a big network, which in the business television world includes any user with 50 dishes or more, the cost of repointing all the dishes may be prohibitive, EFC Startime's Leone says. "A lot have hundreds or thousands of terminals."

Marshall Allen, director of the telecommunications center at Oklahoma State University, predicts that five to seven educational satellite providers will shut down due to the "horrendous price changes."

Despite the costs, some users are choosing to repoint their dishes to get a better price.

Two private satellite networks operated by GE Medical Systems/Training in Partnership TV in Waukesha, WI, will move off Hughes' Galaxy 7 to another satellite operated by another company, due to the twin problems of increasing prices and tight capacity. Maryanne Molter, process leader for GEMS/TIP TV, says, "We're hoping the increase is a short-term thing. By moving off [Galaxy 7] we will find a lower price."

GEMS/TIP TV is expanding to provide 60 hours a month of business television programming, and is looking at alternatives, like purchasing a transponder or transitioning to digital compression technology, as a long-term solution to the problem of ensuring capacity. Molter says satellites are the best distribution method for the two networks, which use 15 to 30 hours of satellite time a month, so the company is going to find a way to deal with the price increases.

Leone predicts that [illegible] marginally successful networks may close. Academic users, who typically have tighter budgets than business users, will probably have to adopt digital video compression faster or join a consortium like the National Technological University, which distributes technical programming to schools and private corporations.

Leslie Wright, associate dean at the Center for Regional and Continuing Education at California State University at Chico, says education satellite users are rethinking their plans. Her programming center purchases 500 to 600 hours per year of C-band and digital Ku-band capacity for academic programming and state and regional agencies. The center is financially self-sufficient, supporting itself from fees paid by corporations who use the classes.

The quadrupling of the price, which was $250 an hour a year ago, is "a lot of money for a university or state agency," Wright says. "For a three-hour transmission, you have to budget $3,000 for the satellite time. Before, it was maybe $900, so it's a huge difference. It may be simpler to send a person around to all the sites [to provide the training]." Satellite time, previously not one of the most expensive items in an academic or training program budget, can now cost as much as production.

Marshall Allen, director of the telecommunications center at Oklahoma State University, Stillwater, says his satellite education enterprise has had to cut its schedule, shop for other sources o transponder capacity and conside how it will survive in the futur due to the "horrendous pric changes" that have occurred.

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"I write it off as marketing and greed," Allen says in reaction to the Hughes announcement of occasional-use price increases. The university, which operates a teleport and programming center for video classes, uses about 3,500 hours of satellite time a year, spending about $750,000 on space segment. The university is also a member of the Interactive Distribution Education Alliance Network (Ideanet), a consortium of four educational groups set up to share programming and collaborate on their satellite offerings. Thousands of schools receive the programs via satellite.

Allen predicts that five to seven educational satellite providers may shut down due to the transponder crisis. While his center can get by this year, it may have to make changes to get through 1996, like moving quickly to the use of digital video compression.

Charles Dutcher, president and general manager of Conus Communications, says that although price increases may hurt users, transponder rates have been artificially low in the past.

BROADCASTERS— DEALING WITH THE SITUATION

The major television networks frequently purchase occasional time to augment their full-time transponder leases. Bob Zitter, senior vice president of technology operations for Home Box Office, says HBO will look increasingly at using fiber for backhauling broadcasts of events like boxing matches, and when fiber has a price advantage, probably make the switch from satellites.

Virginia A. Ostendorf, president of Virginia A. Ostendorf Inc., believes the satellite industry as a whole will be hurt by the price increases because users will look for alternative methods of transmission.

For full-time service, HBO is among those switching suppliers to get the required capacity, but the company made the change out of necessity rather than to get a better price. HBO ended up negotiating for four transponders on Hughes' Galaxy 3R satellite, which is to be launched this fall, to replace transponders lost on the failed Telstar 402. AT&T lost HBO as a full-time customer, although Zitter says the operator "did a good job of trying to come up with viable alternatives. The solutions just didn't work for us."

He wouldn't reveal the price HBO paid Hughes for the new C-band transponders, which will serve HBO's TVRO audience with multiplexed services in analog format. Zitter says Hughes also provided interim capacity on Galaxy 7 to carry the signal until Galaxy 3R is in space, and agreed to terms that will provide capacity to HBO in case the 3R fails.

RE/MAX Satellite Network's production manager, Karin O'Callaghan, says the RE/MAX network is shopping for its own transponder. In the meantime, "the price increase is something we just have to live with."

ABC has a long-term contract with AT&T that locks in rates for whatever limited C-band occasional-use capacity the network can obtain on the Telstar system. Beyond that, ABC has to turn to resellers and other operators for capacity, where the network has felt the pressure of rate increases.

Satellite managers at ABC are less upset about the price increases than the manner in which the satellite operators imposed them. "Budgets are typically done one year in advance," says Richard Wolf, ABC's director of telecommunications and distribution services. "To impose a 50 to 100 percent increase with two to three months notice—no business should have to suffer that."

To improve its satellite distribution situation ABC equipped its 175 affiliates with tracking equipment to allow reception of inclined orbit satellites, specifically Telstar 302. Wolf says the upgrade allows better "intersatellite protection" and gives better access during peak requirement time for programming like sports.

To meet its full-time requirements, ABC purchased its Telstar 401—soon to be 402R—capacity in 1989, which provides a majority of ABC's full-time network distribution needs. "However, we are forced to look to the occasional pool to obtain the additional satellite capacity that is needed for our peak requirements," notes Wolf.

Conus Communications, a satellite news cooperative, uses and resells satellite time both to its 110 member television stations and to certain non-members who aren't competing with members. Conus has three full-time transponders on Hughes' SBS 6 satellite and a small amount of occasional-use time available for sale to users in the horse racing, satellite bingo, business and educational television markets.

Charles Dutcher, president and general manager of Conus, says the era of the $45-$50 "live shot," a short transmission via satellite by a television station, may have come to an end. Conus is charging its members $75 for a five-minute "news window." Television stations affiliated with the big networks used to be able to get five minutes for $45-$50, he says, but everyone is being forced to raise the price. Users who deal directly with Hughes must buy time in increments of at least 15 minutes, he says. Those who use compressed digital signals and only need perhaps 20 percent of a transponder temporarily are being forced to pay for the whole transponder under the Hughes policy, Dutcher adds.

"The new prices will have a serious impact on the stations' satellite budgets. It will make them more discriminating when they use satellites, which will be detrimental to both the news stations and the public," Dutcher says.

He believes Hughes' strategy is to force as many occasional users as possible to become full-

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time satellite customers. "Hughes has made it difficult for companies looking for low-cost satellite time," Dutcher says. "The industry will probably lose some small players, but in general, the marketplace will adapt. The price has been artificially low for occasional use."

The direction in which Hughes is leading the industry does damage small users, but Dutcher says he can't fault Hughes for aiming to maximize earnings on its satellites. "It's hard to tell stockholders what they are doing is wrong, but Hughes may find a backlash will cost them later," he says.

Jackson Teleport's Edward St. Pé believes that "something is out of kilter in the industry," when the price for transponder time quadruples with only a 90-day notice.

Another big programmer who relies heavily on satellite distribution, Viacom Inc., has not felt the pinch of higher prices, says Edward Horowitz, Viacom senior vice president of technology. The entertainment and communications company signed multiyear contracts for about 14 transponders on several satellites back in 1989-90 when an overabundance of capacity kept prices down, he says. Viacom does not resell any excess capacity, and has not felt a business impact from the new prices.

"The satellite market is more expensive than a few years ago," Horowitz says, "but this is nothing compared to the rest of the world." Capacity is much tighter and more expensive over Europe, India and Asia, where Viacom is trying to forecast where the hot markets will be and acquire satellite capacity. When Viacom buys transponders, four elements are weighed: coverage, neighborhood, reliability and price. "The fourth element is price, the others are more important," he says.

But Viacom may see some fallout from the domestic capacity shortage as it looks to set up a VSAT network to tie together 5,000 Blockbuster video rental outlets acquired in a September 1994 deal, Horowitz concedes. Viacom would like to use satellites to distribute promotional material, video for use on store televisions, and management data to the Blockbusters, perhaps with the new generation of satellites to be launched in 1996.

INTERNATIONAL OPTIONS

Customers have few options other than to pay the higher prices. Patterson says the recent Federal Communications Commission proposal to allow international satellites to serve the U.S. market and *vice versa* raises interesting possibilities. But whether existing satellites owned by companies like Orion and PanAmSat will be useful for occasional use remains to be seen. The international satellites are already heavily booked in some cases, and do not have ideal antenna footprints for U.S. service in other instances.

Canada has four geostationary slots allocated for C- and Ku-band, but Telesat is using only three of them. The country also has six direct broadcast satellite slots but uses none of them presently, notes Dennis Billard, Telesat Canada's vice president for sales and marketing. Canadian satellites can help some users, although The SpaceConnection's Patterson notes that many customers want to stay on the U.S. domestic satellites if possible and their antennas need repointing to view the Aniks.

Dennis Billard, Telesat Canada's vice president of marketing and sales, notes that while the company's Anik satellites are full, some capacity could be available in December.

Telesat Canada's two Anik E satellites are filled with users, including AT&T customers who had been slated to occupy Telstar 402R. Telesat operates Anik E1 with 32 Ku-band and 24 C-band channels, Anik E2 with 30 Ku-band and 24 C-band transponders, and Anik C3, which is in an inclined orbit. Anik E2, which is optimized in inclination to the south, can provide better U.S. coverage than Anik E1, which is pointed to optimize coverage to the far north. The Anik signals can be received in the Caribbean, as far south as Puerto Rico, with a 16-foot mesh antenna.

After AT&T's Telstar 402 failure in 1994, the U.S. company became a major user of Anik E2, Billard says. Telesat is the owner and operator of the Anik system. The exact number of transponders and terms of the deal are confidential, Billard says. AT&T had to obtain special regulatory permission from the United States and Canada to use Anik, which was approved for service restoration only. When AT&T's replacement satellite is launched, the company may be required to move its traffic off the Anik.

Billard says the Aniks are fully utilized now, but some capacity may become available by December. Telesat began using digital video compression on the Aniks in April and as customers turn to compression, they will use less capacity. By 1996 and 1997, Telesat's C-band capacity "will come back with a vengeance, although there will still be a crunch at Ku-band," Billard says.

No additional satellites are being contemplated by Telesat for several years since the Anik F series will not enter its planning stage until 1997 or 1998, Billard says. The next generation spacecraft will be launched early in the next century to replace the E's in 2003-2004. Telesat sees no need to expand the Anik E series, even though the Canadian market has temporarily consumed all the capacity, says Billard.

Fifth Dimension's Duncan and other private satellite users north of the U.S. border have discussed putting together a private satellite plan and requesting one of the unused Canadian slots, as the dearth of capacity has begun to affect Canadians as well. However, Telesat Canada has a monopoly on satellite ownership, granted in 1969 and maintained because the entity provides service to northern areas. This means that no private satellite can be launched unless Canadian satellite rules are changed.

[illegible]

In the meantime, Telesat Canada is asking for a 12.4 percent rate hike, which Duncan says he will support provided that Telesat is deregulated. He says Canadian programmers and businesses cannot get the satellite capacity they require. Demand exceeds supply for C-band in Canada by about 24 transponders, Duncan says.

THE RESPONSE FROM U.S. OPERATORS

Back in the United States, satellite owners defend the price hikes by saying that artificially low prices help no one in the long run. They say selling below cost only drives operators out of business.

Hughes raised prices to make occasional use profitable enough to continue it, according to Carl Brown, senior vice president for Galaxy satellite services at Hughes Communications Inc. He blames the capacity crunch on the demise of satellite operators who served markets that "wouldn't pay the freight. You can only get something for nothing for so long. The operator has to get a fair price."

Brown says occasional users should not expect bargain basement prices just because they have small requirements: "It's unfathomable that a customer who buys one hour whenever he wants would get a better price than a customer with a long-term commitment." But occasional use was founded at a time when the transponder market was in a glut, and so the satellite owners find themselves explaining the economic facts of life about how expensive it is to replace an old satellite. "A satellite costs a quarter of a billion dollars. You can't take an asset that costs a quarter of a billion dollars and sell it for $400 an hour," Brown says.

Satellite operators selling occasional-use time can hope for a 30 percent utilization rate at best, meaning that those transponders are booked and paid for only about 40 hours a week, Brown says. The operator needs to get the "full value" of a transponder, which Brown says is about $180,000 a month, from those 40 hours to make enough to stay in business. To find a fair price using these figures, all one has to do is divide the value ($180,000) by the hours (160 in a month). [*Editor's note: From this formula, a "fair price" would be estimated at $1,125 an hour.*]

He says the big broadcast networks and business network operators can afford the higher prices, as can data customers, who have been paying $1,000 an hour for occasional use for more than a year. The one sector that he thinks has a legitimate hard time swallowing the increase is education. "They just don't seem to have any money. Whatever you charge is more than they have to pay," says Brown.

"AT&T has not raised its prices in 1995," says Karl Savatiel, AT&T Skynet Satellite Services' marketing/sales, new business development director, although he concedes that the company did make a "slight" increase in 1994.

AT&T is committed to serving the occasional-use market. The company has dedicated numerous transponders to the service: ten C-band transponders on Telstar 302, which is in an inclined orbit; two C- and two Ku-band transponders on Telstar 401; and three Ku- and two C-band on the 402R satellite to be launched later this year.

Andreas Georghiou, vice president of satellite services for GE American Communications, echoed the other operators, pointing to supply and demand as the cause for price increases. "We are doing things to try to alleviate the crunch," Georghiou says, citing the use of inclined orbit satellites for longer periods, encouraging the use of compression and accelerating the launch program as much as possible.

GE is committed to serving its satellite newsgathering customers with occasional-use capacity, Georghiou says, but noted that the ideal situation for operators is to sell all transponders on a full-time basis. Americom has one C-band transponder on Satcom C1 for occasional use, and 18 Ku-band transponders, including some on inclined orbit satellites. An unspecified number of GE 2 transponders will also be devoted to occasional use, he says.

In the U.S. market, the prices for full-time use of transponders also rose, sources say. The increase is noticeable especially on newer satellites. One buyer says that monthly prices on older satellites were in the range of $55,000 to $65,000 per transponder. On the new generation birds, the owners are getting $100,000 to $150,000 per month, per transponder, depending on various terms and other factors.

Duncan is in the business of reselling the capacity of yet-to-be-launched satellites as well, and thus is familiar with the fluctuating market prices of full-time transponders. His company has acquired six transponders on GE 1, due for launch in early 1996.

Full-time transponder fees have gone up, he confirms. The theoretical price of a monthly lease for a Galaxy 5 transponder would be about $300,000, he says. No capacity on the satellite is available, so the estimate is based on what resellers believe they could get for it. Fifth Dimension does control use of some Galaxy 7 transponders, for which Duncan says he could get $150,000 tc $170,000 a month. Other representative prices fo unlaunched satellites are $150,000 a month for a Galax 3R transponder and $125,000 to $140,000 a month fo transponders on GE 1. If anything was available on Ani E2, the price would be $125,000 to $130,000 a month

Brown would not disclose specific prices for Hughe transponders, but says Ku-band prices have remaine

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firm at about $175,000 to $180,000 per month. C-band prices have increased, he confirms. Brown says satellite owners like Hughes have not seen a windfall from "exorbitant" prices because they have no immediate full-time capacity to sell. The brokers who obtained control of transponders in anticipation of the shortage are the ones making money from the crisis, Brown says. He cites the example of a major unnamed broker who auctioned off a C-band transponder on Galaxy 6, setting a bidding floor of $140,000 a month. The transponder was preemptible (subject to being taken away by a higher-priority user who needs it), and thus not as valuable as a nonpreemptible transponder. "That is gouging," Brown says.

The new satellites are heavily presold, but not entirely sold out, according to several buyers.

Brown says Galaxy 3R, which will be launched in early December, is totally sold out. In June, Hughes had capacity for sale on Galaxy 9 and 10 for customers who could wait until May 1996 or 1997, their respective launch dates. Galaxy 9 is an all C-band satellite that will be launched on a Delta next May. Galaxy 10 will carry C- and Ku-band transponders when it is launched in 1997. Pricing was comparable to the same monthly fees charged for the current Galaxy 4 and 7 satellites.

Galaxy 3R has C-band transponders for U.S. use and Ku-band that will serve Latin America with DTH television signals on a temporary basis until Galaxy 8I is orbited. Then the Ku-band capacity on 3R will return to U.S. service, putting more capacity into the U.S. market.

Savatiel would not cite specific prices for AT&T capacity and noted that the 402R bird is completely sold out. When the all-digital Telstar 5 is launched in 1997, AT&T likely will be able to offer those transponders, plus the use of capacity on the Anik E2 that is occupied today by Telstar 402R's customers-in-waiting. Savatiel acknowledged that full-time lease prices are up by about 25 percent from two years ago.

GE Americom's GE 1 satellite will be launched in April 1996 on an Atlas rocket, followed by GE 2 in the last quarter of 1996 on an Ariane. Georghiou says as of early June 1995, GE had a few C-band transponders left for sale on GE 1, which was completely sold out, after convincing some government users who planned on using GE 1 to use Spacenet 2 instead. No Ku-band transponders were left on GE 1, but plenty were available on GE 2, he says. As of June 1995, the company did not have an orbital slot or launch contract to put GE 3 up, but was looking for "precommitments" for transponders, Georghiou says.

HIGHER PRICES ARE HERE TO STAY

Leone says many of her customers who purchase full-time transponders are holding back on decisions, wondering what the market will do next. They are reluctant to make long-term commitments now when the prices may be at their high point, if the supply increases and prices are forced down. But Leone and other specialists can't say for certain when the situation will turn around. She says making predictions beyond five years is virtually impossible, and points out that even in the short term, events like the 402 failure and the subsequent disappearance of any available transponders are not predictable.

Are the higher prices gouging or just the reality of supply and demand? A satellite can cost more than $200 million to put into space, and Duncan says that at monthly lease prices of $65,000 to $70,000, "You might as well put your money in the bank and leave it there. The prices had to come up. The reason there is a crunch is the prices were too low, and people say compression is coming up [so why build new satellites?]"

While the new prices might be hard to swallow, Leone says they can be justified. The fixed administrative cost of selling occasional-use time remains even when there is little available to sell, so the operators must charge more to cover those costs. "I don't see any evil empire," she says.

"This is a pure economics 101 model based on supply and demand," Savatiel says. In the 1980s, the satellite business had seven suppliers. Prices were irrational and four of the suppliers have left the business. "I don't think prices will come down substantially in the future," Savatiel says. "We're not going to have the overcapacity in the market that was the case in the 1980s. The people left in the market aren't crazy; they are astute, big corporations, staffed with executives who are concerned with how they are going to pay for future investments in satellites."

If all of the new satellites being planned by U.S. operators materialize [see *Via Satellite*, June 1995, pp. 18-28], another glut of capacity will appear and prices will drop, Duncan believes. But the prices will not fall far because the operators must make returns on their investments.

Brown says he does not see any relief in the shortage for at least 18 to 36 months. And even though the current U.S. operators are investing in a fleet of new expansion satellites, he does not expect the new capacity to glut the market and cause prices to plummet again. The operators have gotten smarter about the business in the last decade, and they will build the satellites and store them in boxes on the ground before launching without firm user commitments, Brown says: "The operators will want to see at least half the satellite sold by the day they put it up."

The Jackson Teleport's St. Pé agrees that the market will determine the price, but he questions whether the higher satellite prices can hold in the face of competing technologies and the onset of digital video compression.

Leone agrees that the higher prices are probably here to stay. "Once they've established a price point, it is not usual that they will move back. Hughes has not said, 'This is an emergency situation,'" she says. "On the other hand, the market forces determine everything. If there is a glut, prices will drop."

If Galaxy 3R, Telstar 402R, GE 1 or any of the other new satellites fail at or after launch, the market is going to be in for more trouble. Should there be more failures, few if any options will exist for users and resellers awaiting those spacecraft.

Contributing writer Theresa Foley is a journalist who specializes in commercial space. She is based in Key West, FL.

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APPENDIX D

An Overview of the National Education Telecommunications Organization

These are exciting and challenging times. As the nation moves forward on a course for economic growth and productivity for the 21st century, citizens at all economic levels, policymakers and educators are faced with difficult choices. The nation's education systems, are endemic to the nation's economic health and security. Whether officials are reducing the federal deficit, or changing health and defense policies, American education productivity, or the lack of it, will set the pace of economic growth along with the standard and quality of living for Americans for years to come.

Technology has rapidly transformed every sector of our lives--except education. Although telecommunications has turned the world into a global village, America's schools for the most part have remained relatively isolated enterprises. While the educational resources available in this country and around the globe are rich and growing exponentially, the United States is without a technologically integrated telecommunications system available to transport these resources to all children and adults regardless of the wealth and geography of their community.

The plan is to create an integrated nationwide multi-technology infrastructure, a dedicated satellite that links space and existing secondary access roads, i.e., telephone and cable, over which teaching and education resources are delivered and shared with students, teachers, workers and individuals.--A transparent "I-95." The vision is to "wire" together classrooms, workplaces, libraries and other places of learning, nationwide and internationally, through a dedicated telecommunications system, which can be accessed simultaneously through a telephone instrument, a computer, a fax, a video camera and/or a television set. A modern-day "learning-place" for the rural, urban, migrant, disadvantaged and youths at risk to have equal and affordable access to and utilization of educational resources, teaching and learning tools.

NETO/EDSAT is a not-for-profit organization bringing together public officials, K-12 school districts, colleges, educators, government agencies, and public and private education users of telecommunications to aggregate their buying power, and control their own destiny with open, equitable, low-cost and interconnected telecommunication services.

Transportation infrastructures are effective and economical when they provide access to increasingly greater numbers of users and when the primary systems interconnect through multiple secondary transportation systems. America's Interstate Highway system gave the American family access to employment, housing, education and other social benefits which far exceed our greatest expectations and dreams.

Access to information is critical to a knowledge-based enterprise like education. Investments in communications' infrastructure for a global economy is closely tied to the growth and economic viability of the education sector. Of equal importance, the U.S. is left with no other choice than to reshape its schools to become the "crown jewel" of a global democratic society. We must prepare all students, regardless of wealth, geography and population density, to be productive, participating citizens for the challenges they will meet in the 21st century.

We hope you will join those of us who share this vision for the "information age."

National Education Telecommunications Organization/Education Satellite
1735 I Street, N.W. Suite 601 Washington, DC 20006 202-293-4211 voice 202-293-4210 fax 800-220-1235 toll free

POLICIES and PURPOSES:

The National Education Telecommunications Organization will encourage cooperation and in conjunction with education institutions, states, and territories and other education program providers will establish, as expeditiously as practicable, an education satellite and other telecommunications systems. These systems are to be governed, managed, and operated by a National Education Telecommunications Organization (NETO) as a part of improving equitable and quality instruction and education opportunities for all children and adults. These systems will be responsive to the public needs, education goals of the states and territories, and will contribute to access and utilization of the national education resources.

The National Education Telecommunications Organization, a not-for-profit, non-federal, voluntary organization will help to provide new and expanded telecommunications services as promptly as possible at the national and international levels to all schools, colleges, universities, libraries, and other distance education centers. In implementing this program, care and attention will be directed toward providing such services to all children and adults regardless of their economic status, personal wealth, or the wealth of their community, or their geographic location, as well as those with economic and geographic advantage, toward delivering efficient and economical access and utilization of satellite and other telecommunication services, and toward the reflection of benefits of these technologies in the quality and charges for such services.

NETO will be organized and operated so as to maintain and strengthen instructional and educational opportunities and services in the provision of communications services to states, schools, colleges, universities, libraries, and other distance education centers.

The National Education Telecommunication Organization's primary purposes include equitable, low-cost satellite services, education, training, information and research. Its programs are developed to meet the goals of: (1) improving this country's educational, training and instructional opportunities, (2) improving the opportunities for an equal and quality educational experience for all children and adults, regardless of their geographic location or wealth of the community, and (3) improving access to equal education information for schools, colleges, universities, libraries and other distance education centers.

Services, programs, projects and activities are developed with special care to reach, educate and inform rural and urban schools, migrant students and parents, at-risk students and underserved pupils at all levels of education.

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Shelly Weinstein

President/CEO

National Education Telecommunications Organization/EDSAT

Ms. Weinstein is the President and Chief Executive Officer of the National Education Telecommunications Organization. She has 20 years experience in the supervision and establishment of programs to implement major education, telecommunications, energy, and environmental policies from her work in government, foundations, and the private sector.

Prior to her present position, Ms. Weinstein was Vice President for Communications with the College Satellite Network and served for over five years as director of the Kettering Foundation's Washington, D.C. office.

She was a member of President Carter's "White House Energy Policy and Planning Staff" serving as Special Assistant to James Schlessinger, Assistant to the President. During her tenure, she created, implemented, and mobilized nationwide public participation in the President's national energy plans and policies. This included authorship of the National Energy Plan, Summary of Public Participation for the Executive Office of the President. A charter member of the Department of Energy, Ms. Weinstein served as Director of Environmental Liason.

Ms. Weinstein also served as Director for the Task Force on Citizen Participation, reporting directly to the Secretary of the Department of Health, Education, and Welfare. Her background also includes national and state experience in the fields of school governance. She directed the "Maryland School Finance Study", funded by the Ford Foundation and the Greater Baltimore Commitee of Maryland.

Ms. Weinstein has published extensively and has served as editor and director of a major national review and book on school governance, entitled: Public Testimony on Public Schools (McCutchan Publishing Co. August, 1975).

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Senator ROCKEFELLER. Thank you.
Mr. Wright.

STATEMENT OF PAT WRIGHT, SENIOR VICE PRESIDENT OF EDUCATION, ETC WITH TELECOMMUNICATIONS, INC.

Mr. WRIGHT. Thank you, Mr. Rockefeller.

My name is Pat Wright. I am senior vice president of ETC with TCI. ETC is a fully owned subsidiary of TCI. ETC stands for Education, Training, and Communications. It is based here in Washington, DC. TCI created ETC to work closely with the education community, and hopefully, in a collaborative nature, breathe new life into our Nation's education systems through advanced communications technology and innovative approaches to learning.

I think it has been quite well articulated here this morning the enormous challenges that educators are facing as they approach this new paradigm of teaching and learning, with new tools and new resources and being on the very edge of bringing a tremendous amount of new resources to bear, regardless of where a school happens to be located or the time of day it happens to be.

Now, TCI's interest actually began in education back in 1989. The company was very proud to be a founding member of the Cable in the Classroom organization. Over a period of about 6 years now, the company has extended resources through cable connections over 24,000 schools within the services areas in which the company operates, bringing 500-plus hours of educational, free programming to over 650,000 teachers and 12 million students.

In the course of that roll out of the education initiative within the company, we have also developed 10 research and development sites around the country, being careful to locate them in a cross-section of America, both demographically and geographically. We have worked very closely with schools to understand what happens when these resources actually arrive at schools. How do they integrate into the curriculum? What are the issues that surround a teacher's acceptance and use of the technologies that have been described?

I think the points that were made by the first panel this morning, I would like to, rather than go briefly into my written testimony—it is here for the record—but I would like to respond to some of the key points that were made this morning, beginning with the issue that seemed to be overriding with everyone's testimony: How do we make these technologies affordable and accessible to endusers?

One of the things that we have been challenged to do as a company is to not only take advantage of the existing technology that is out there, some of which was ably demonstrated this morning, but take a look into the emerging technologies—digital technologies, the technologies that would allow us to provide combinations of text, of full-motion video, of animation, of simulation—and deliver those kinds of resources virtually anywhere in the world. Those technologies are close at hand. How we merge those with an existing set of technologies, as we heard this morning and witnessed this morning, are very productive.

One of the first things that ETC is doing is taking a look at how we can leverage existing infrastructure. I will give you two concrete examples. Next fall, when school opens, we will deliver three courses in elementary Spanish aimed at first and second graders, third and fourth graders, and fifth and sixth graders. These courses will be delivered via the Learning Channel, a channel that is a subsidiary of the Discovery Communications Network. It enjoys a tremendous reputation in terms of programming in the education community for high, very credible educational resources.

By combining real-time interactive distance learning via a channel that is well respected, has tremendous programming already available, does a couple of things in terms of addressing this affordability and accessibility. No. 1, it makes these courses available to 61 percent of the schools in the country today that have cable hookup.

We are also partnering with a sister company of TCI, Primestar by TCI. Primestar is a small, fixed-dish digital satellite company. Primestar by TCI is committing 10,000 of these dishes, which we will place in rural, remote and underserved areas of the country so that these elementary Spanish programs and the free programming that the cable industry is providing every month for schools will be available. Because the technology is digital, it is not just video programming that is available to the school.

We can also deliver a tremendous amount of data. Data can be, as we heard this morning, not only accessed through other data bases and resources, but very valuable lesson plans and curriculum materials that can assist classroom teachers and others in implementing the new technology. We are very excited about that.

Another point we heard this morning is how critically important it is to address the issue of teacher training, staff development, and professional development. We are in the process now of putting together over 300 hours of high-quality professional development. We have learned a lot, and not only because of our investment in 10 research and development sites.

Senator Burns referred this morning to the Montanan we were able to lure from Missoula to head up the J.C. Sparkman Center in Denver. The Sparkman Center is a state-of-the-art education training center for teachers, for administrators, for parents, and others, in which we devote a tremendous amount of time and resource to working with the education community, in terms of addressing the training needs.

We currently have a second facility here in Washington, DC. under construction. It will open in June of this year. A third facility is planned for the West Coast by the end of 1996, for operation in early 1997. All three of these facilities will serve thousands of educators onsite, but will be linked to our distribution system, so that those resources can be shared with thousands of educators without regard to time or distance or location.

So I think it is a very important point that we emphasize that we can leverage existing infrastructure to enhance the opportunities that are available today, and then face, hopefully, some of the other challenges that we have heard raised this morning. We know that the equipment in these classrooms to facilitate the type of demonstration we saw this morning is incredibly expensive. It is a tremendous challenge that we face in working with the education community, in terms of driving these infrastructures and these technologies deeper into school districts and classrooms.

There are ways that we can do that, I think. I think the point was made this morning—I think it was well made—that what we must do is to seek out appropriate public-private partnerships, where the private sector works in tandem with the public sector to provide the types of resources that give these kinds of technologies a fighting chance of being successful. As was pointed out, it is more than a computer in a classroom. It is more than a satellite dish on the roof. It is more than a piece of optical fiber. It is also the connectivity issue that reaches beyond classrooms.

I hope we can all envision a day where schools and homes are part of the same network, serving the same resources and drawing upon the expertise of people not only in distant locations, but within the same community, as was pointed out I think very ably by Dr. Elliott earlier this morning.

So it is not only that, it is the training. It was touched on this morning, and I think it deserves greater attention and greater discussion—the tremendous amount of effort that has to go into maintenance and support programs for the kinds of tools and infrastructure that we all envision being places in schools throughout the country.

If we can bundle these types of packages together and if we can consider networks and end devices, whether that end device is a television set or a computer or a set-top box or whatever it happens to be, with the appropriate training, with the appropriate technical support, then we have a fighting chance of seeing these types of new tools and resources penetrating deeply enough into all the schools across the country to give us a fighting chance of moving from this industrial age model that was referenced to a true information age model.

It is a pleasure to appear before you. I look forward to your questions concerning perhaps some of the specifics.

[The prepared statement of Mr. Wright follows:]

PREPARED STATEMENT OF PAT WRIGHT, SENIOR VICE PRESIDENT, EDUCATION DIVISION, ETC WITH TELECOMMUNICATIONS, INC.

Good morning, Mr. Chairman and members of the Subcommittee. My name is Pat Wright. I am Senior Vice President of the Education Division of ETC w/tci.

TCI created ETC to work closely with educators to breathe new life into our nation's education system through advanced communications technology and innovative approaches to learning. Our nation's elementary and secondary schools face enormously difficult challenges. Bringing about lasting change for the better will be a complicated process requiring difficult choices in the public and private sectors. We are convinced that technology can and will make an important positive contribution.

TCI's interest in education actually began in 1989 when it took a leadership role in creating "Cable in the Classroom." Today, "Cable in the Classroom" provides 525 hours of educational programming per month *free* to 12 million students, 650,000 teachers, and 24,000 schools in TCI service areas.

Over the years, we heard frequent requests from educators for training in new communications technologies, help with installation and maintenance of networks, connectivity between schools and broader communications systems, access to on-line services and data bases, and access to advanced multimedia curricula.

TCI and ETC responded with high quality educational programming delivered through cable television to public and private schools. We invested millions of dollars to bring cable to more than 90 percent of the schools located within our service areas. We created model schools which serve as national research and development centers for educators, administrators, parents, and students to analyze the most effective applications of new technology in various curricular areas. Finally, we built a unique and sophisticated training center to teach the teachers about state-of-the-art technologies and the many instructional applications that are available through the use of these new tools. Since the launch of ETC in February 1996, we began construction of a second training facility here in Washington, DC, and a third facility is scheduled for construction on the West coast late in 1996 for operation in the fall of 1997.

In short, we believe that industry's commitment to education must go beyond providing more of today's programming or a simple hook-up to an existing distribution network. Such an approach is too simplistic. We must recognize that technological advances are transforming our educational system from an industrial-based model to an information-based model.

One of the benefits of this technological transformation is distance learning, the subject of today's hearing. Frankly, it is not easy to define distance learning. The name suggests the image of a student sitting in a classroom in Durango, Colorado, watching on a real time, interactive basis a lecture from a Nobel prize winning professor from the London School of Economics. Certainly, distance learning includes that capability. But it includes much more. Distance learning can be 10,000 miles, but it also can be 1 mile. Distance learning "in the local loop" is critical to connect schools with libraries, to allow adults to continue their education at home, or to enable an art teacher who specializes in watercolors to communicate her craft to students in 50 local schools, not just one or two.

Distance learning is providing access to educational resources where and when they are needed.

That can take many forms. Let me describe a distance learning project in which ETC currently is involved. ETC recently entered into an arrangement with The Learning Channel to explore the confluence of technology and education. As you know, The Learning Channel is a subsidiary of The Discovery Networks, a well-known provider of high-quality television programming. Through this partnership with The Learning Channel, ETC now provides 300 hours per year of high-quality educational programming. Students suddenly have access to vast amounts of new, innovative learning resources. This programming is designed to assist teachers as well. For example, we created innovative partnerships with universities, including the University of Montana in Missoula, that allow teachers to earn college credit toward higher degrees. Similarly, we are designing a facility on the campus of Montana State University that will provide state-of-the-art distance learning technology. The center will feature the latest "tools" for accessing information and resources related to learning. It also will feature the most up-to-date convergence of television, computers, and telephone applications for teaching and learning in an information-age classroom. The center will be accessible by schools and homes throughout Montana.

We are particularly excited about two programs offered through our partnership with The Learning Channel:

- Geonauts—Geonauts is an "electronic field trip" in which the Grand Canyon becomes a national laboratory for exploratory science. The program is provided in conjunction with the National Park Service and is integrated into the 4th through 6th grade Science curriculum 2 days a week.
- Elementary Spanish—This is a live, interactive program to teach Spanish to elementary school age children. Although educators increasingly stress the importance of teaching foreign languages at the elementary school level, most schools are unable to offer such training. This program offers three Spanish language classes (first and second grade, third and fourth grade, and fifth and sixth grade) 2 days per week.

By taking advantage of the scale economies available through cable television distribution, we are able to provide these and other educational tools to vast audiences. The Learning Channel is available to 61 percent of the nation's public schools and 42 million homes. Further, we have made special efforts to offer this programming to rural and other underserved areas through PRIMESTAR, a direct broadcast satellite company owned by a consortium of cable operators, including TCI. TCI has agreed to provide 10,000 satellite dishes to schools in underserved areas so that they may receive The Learning Channel as well as PRIMESTAR's other program services. Other PRIMESTAR partners will be making similar commitments. Mr. Chairman, you have spoken eloquently about the need to ensure that technology does not create a society of information "haves and have nots." We believe the PRIMESTAR program is a very significant step in addressing your legitimate concern.

Technology is evolving rapidly, with fundamental consequences for virtually all our nation's institutions. This transformation is being driven by the convergence of

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three critical developments: *first*, fiber optics, which has become the most cost-effective interactive broadband communications infrastructure; *second*, high-speed microprocessing, which allows virtually all kinds of digital processing at a very low cost; and third, operating system software that has evolved sufficiently to link distributed personal computers via high-capacity digital networks.

When coupled with the digitization of print, audio, and video, this technological convergence makes multimedia and interactive media more than just buzzwords. Education, like every other business, is being transformed, and a new education paradigm is emerging.

The new, information-based model eliminates the barriers of time and location. In today's education system, students must be ready to learn when teachers are ready to teach. And they are limited to the classroom environment.

Technology unbinds the educational experience. Learning will take on a whole new look and feel. What we are likely to see is real-time presentation, on-line conferencing, and artificial intelligence that will allow students to access high quality, interactive multimedia resources on demand. Technology will allow students to access the expert when he or she is needed and work through virtually any course at their own speed. This is the 21st century version of the old Zen proverb, "When the mind is ready, a teacher appears."

Equally important, the technology will allow students to draw expertise from many sources simultaneously. Courses of the future will not be orchestrated by a single teacher or professor representing a single institution. Instead, they will combine the expertise of many teachers and other experts electronically. Teachers will be transformed from dispensers of knowledge to facilitators of learning. This fact in itself represents one of the most dramatic paradigm shifts ever imagined in terms of the curriculum of the future.

These are some of my ideas about the classroom of tomorrow. I will provide further amplification on distance learning and the role of technology in just a minute. But before doing that, I want to underscore something critical about the convergence of education and technology. In order to ensure that the transformation of our education system occurs efficiently, we need strong, cooperative partnerships between educators and industry.

In particular, I want to stress ETC's view that educators must determine the shape, focus, and functionality of the classroom of the future. Technology should not drive the education model. Technology is the enabler. Industry can create a group of educational "tools," but educators will have to determine how to adapt the tools to the particular curriculum needs of their local communities and educational institutions.

Of course, industry must play an important role in helping educators make informed decisions about how to use technology. There are a host of new skills educators will need to acquire if they are going to be effective in applying technology in their classrooms. Before teachers can clearly see a vision of how their classrooms will be affected, they have to understand what technology is available. It's difficult to do that when you are in a classroom that doesn't even have a telephone.

That is why we created the J.C. Sparkman Center for Educational Technology. The Sparkman Center is a technologically advanced facility that provides hands-on training to help educators find solutions for the new learning environment. The Center features cable-delivered resources and other technologies, including computer and CD-ROM applications, multimedia development, desktop video conferencing, video disc technology, and broadband connectivity to on-line data services and the Internet. Teacher training seminars typically last 3 days. In addition to providing an overview of the numerous forms of technology available for use in classrooms today, the Center provides all participants with a value-added package of software, manuals, and other teaching and reference materials. Educators who attend a seminar at the Center return to their communities with a better understanding of how they can integrate educational technologies into their daily teaching environments.

ETC is analyzing how to provide additional teacher training and support directly into local communities. We now make some Sparkman Center training services available via satellite to cable systems. We are exploring other ways to use our broadband networks to enhance teacher training. For example, we are considering using the networks to connect local schools with teacher colleges. The idea is to maximize our resources to provide learning when and where teachers need it.

Moreover, because the transformation to an information-based education system will be complicated, TCI has developed a 5-point "Educational Turnkey" solution. This approach provides school districts with a complete package of hardware, software, broadband network connections, teacher training, and maintenance support *on a leased basis* and for a fixed cost per student per year. We believe this "one-stop shopping" model will simplify educators' efforts to re-tool schools with new technology. Let me touch briefly on the five elements of TCI's turnkey education package:

1. *Local Area Networks.* ETC will create local area networks within each school building in a district to provide voice, video, and data connectivity within the school.

2. *Wide Area Networks.* Wide area networks will provide broadband connectivity throughout the school district, among the schools, homes, administrative offices, social services organizations, libraries, colleges, and other resources, such as the Internet.

3. *Hardware and Software.* ETC will provide state-of-the-art hardware and software appropriate for multimedia research and teaching. At least 4 to 6 computers can be installed per classroom.

4. *Teacher Training and Support.* In order to make the transformation from dispensers of knowledge to facilitators of learning, teachers will need to acquire a new skill set. ETC has made staff development a major component of its turnkey solution. As I mentioned earlier, ETC's Sparkman Center, as well as our plans to use TCI's broadband networks to provide teacher training directly into local communities, will offer instruction on how to effectively integrate technology into teaching, management, and administration.

5. *Network Maintenance.* On a national basis, ETC will support the installed turnkey networks from a central command location, using local support personnel where appropriate. Using sophisticated software tools, ETC will be able to monitor the system down to the student's PC and to quickly correct any software and hardware problems.

ETC's turnkey approach is not simply a pilot project or marketing trial. It is a full-fledged commitment to a long-term partnership with educators.

Most importantly, by offering schools a packaged technology solution with a fixed-cost lease arrangement, ETC makes the transformation to the new education paradigm more affordable. I will address the issue of affordability in more detail below.

ETC's experience has demonstrated that if properly used, even over a short period of time, these new technology tools in turnkey school districts and elsewhere can produce dramatic positive results. One concrete example is provided by our "Showcase Schools Project."

In this project, ETC collaborates with the principal and faculty to design model schools. These schools operate as laboratories for educators across the country to gain a greater awareness of how to use the new technology to enhance the learning process and to equip students with the skills needed to be productive in our competitive, global economy.

ETC's showcase schools include elementary, middle/junior high, and secondary schools located in the following rural, suburban, and inner-city areas: 1. West Linn, OR; 2. Pueblo, CO; 3. Dallas, TX; 4. Columbia, Mo; 5. Chicago, IL; 6. Evansville, IN; 7. Carrollton, GA; 8. Washington, DC; 9. Baton Rouge, LA.

In Carrollton, GA, for example, we established a fiber optic ring around the entire school district connecting all classrooms and homes, the juvenile justice system, and the social service agencies. We also served as systems integrator in networking six multimedia computers and extensive video networks in every classroom. Further, we initiated the "Parenting Channel," which provides information to parents about various aspects of their children's development, including such things as nutrition guidelines and immunization requirements.

The results have been very encouraging. In Carrollton, GA, for example, the dropout rate decreased from 28 percent to 5 percent. Failure rates dropped significantly. Educators in Carrollton estimate that the reduced dropout and failure rates result in a savings of nearly $1 million per year. Without raising an additional dollar, Carrollton has substantial funds that it can use to hire new teachers, upgrade special education classes, or repaint classrooms. The point is not always to raise new funds, but to redirect existing funds more efficiently.

Up until this point, I have focused on the tools educators and school systems may use to enhance the learning process. But the scope of the new education paradigm transcends the traditional classroom. It creates new opportunities and venues for individuals to use technology as an educational tool. A primary extension of the traditional classroom will be to the home. Soon, we will no longer ask the everyday question, "What's on television tonight?" Instead, the question will be "What do you want to be on television?" And the answer will be "Anything you want. Anytime you want it."

In survey after survey, ETC has found that education is at the top of consumers' lists of what they want in the next generation of television services.

Fortunately, TCI and the cable industry are uniquely suited to meet this need. Cable passes over 90 percent of American homes, and over 638 of American families subscribe to basic cable. TCI continues to work on the next step which is introducing interactivity and multimedia education applications into this broadband environment.

Interactive services in which customers alter the content of what they see on the screen are now being introduced in a number of cable systems. TCI is testing video conferencing technology over PCs using cable plant to extend computer networks from schools to children and parents in their homes.

These two-way connections between the home and the school have proven beneficial for teachers, students, and their families alike. They increase the flexibility of teachers' hours by allowing them to gain access from home, provide parents greater access to their children's teachers and schoolbooks, and enable students to learn at home when school is closed.

A key component to these and other home-based educational efforts will be the digital set-top box. This piece of equipment, located in the consumer's home, will contain sufficient power and memory to deliver multimedia educational services directly to consumers' TV sets. TCI has already ordered over one million digital set-top boxes.

Cable operators are also currently undertaking extensive trials with cable modem technology which, among other things, will afford consumers access to the Internet and other on-line resources at speeds up to 1,000 times faster than what is possible using current dial-up telephone technology. I wish to stress, however, that access to the Internet is not a panacea. The Internet is only one of the "tools" that may be used to create an effective education system. Moreover, educators, as well as parents, have expressed concerns about content on the Internet and have told us they do not necessarily want students to have unbridled access. It is not my purpose to resolve those issues here. I only point out that the issue is more complicated than simply hooking homes or schools up to the Internet.

The key is to provide educators with a smorgasbord of technology tools. In cooperation with industry, educators can select from this variety of tools to meet the unique educational goals of their local communities.

While the technology tools I have been discussing will do wonders to transform our education system, we must be honest in acknowledging that this transformation is a financially daunting prospect. No company or industry can do it for free. Rather, all participants must be creative in designing solutions to make this transformation affordable.

A recent survey of all 50 chief State school officers indicated that $31.5 billion is required for the hardware and software to transform our public schools to the information-based education model. Add another $10 billion for the telecommunications infrastructure portion and the total cost to retool America's public schools is approximately $41.5 billion.

Notwithstanding these imposing costs, I believe industry, and certainly the cable industry, is committed to undertaking the transformation in a way that recognizes our obligations to the communities in which we live. We are prepared to be creative and to work hard to do this in a way that is affordable for schools. Government must do the same.

Educators have told us that they face three major financial hurdles in taking advantage of the new technology.

- *First*, the initial capital cost to install the new technology tools and the supporting networks has been prohibitive in many cases.
- *Second*, technology has tended to become obsolete over a relatively short period of time.
- *Third*, technology expenditures have tended to be unpredictable and therefore difficult to budget for. For example, many current infrastructure offerings are based on "metered use" which results in higher charges for greater use.

ETC has designed various approaches that address each of these issues. As I mentioned earlier, ETC's "turnkey" solution allows schools to enter into a *lease* with ETC for a bundled education solution. The lease arrangement is for an 8-year period at a *fixed dollar amount* per student per year. ETC will replace critical hardware and software every 3 to 5 years.

This approach answers each of the educators' primary concerns. The lease allows schools to avoid the large up-front capital costs of the network and associated equipment. The fixed cost component makes it easier for school districts to manage their budgets because they will know up front how much the system will cost. And the periodic replacement of critical hardware and software accommodates the rapid change of technology.

In short, by providing a bundled offering to schools at a fixed lease price, ETC's turnkey solution drives the price of educational technology down and the quality up. Educators have noted that it makes the wide-scale deployment of technology more affordable. Although it is too early to tell, I believe ETC's turnkey approach could reduce the overall price for school districts by as much as 20 percent.

ETC is convinced that metered access to these broadband networks makes no sense. Nor does it make sense to float a 20-year bond issue to pay for something that has a practical lifespan of 4 to 7 years.

ETC has devised other mechanisms to offset the costs for schools to make this technological transformation. The first one is our equipment giveaway program. In a turnkey school, when new equipment replaces the old leased equipment, ETC transfers ownership of the replaced equipment to the school at no additional cost.

In addition, ETC has explored potential revenue-sharing arrangements with schools. For example, ETC is considering sharing with schools a portion of the revenue it receives from sales of educational services directly into the home. These arrangements would create additional revenue streams for schools that could further offset the costs incurred to create broadbased educational networks. At a time when property taxes traditionally used to fund education are tapped out, such potential new revenue streams are particularly important. Again, public-private partnership is the key.

Of course, other mechanisms may exist to make this technology transformation affordable for all. For example, it may be appropriate to defray the subscription costs of interactive education as an element of job retraining programs. Also, it might make sense for government to provide incentives for profit-making entities to engage in community infrastructure development, including education-related development. The main point is that we all need to think creatively about existing and new ways to fund the transformation to this new education model.

Finally, the affordability of this transformation, as well as the timing, will be impacted directly by the economics that exist in the industries that undertake the transformation. If the economics are favorable, the broadband networks and associated technology will be more affordable and available more quickly. If the economics are unfavorable, the transformation will be more costly and will be delayed. In this regard, I congratulate you on your leadership role in the passage of the Telecommunications Act of 1996. The Act creates strong incentives for industry to step up investment in the infrastructure and equipment necessary to make educational reform a reality.

Before closing, I want to reiterate briefly our commitment to ensuring that low-income and rural schools share fully in the benefits of new technology. We simply must find ways to apply educational technology in an egalitarian fashion.

We recognize that we don't yet have all the answers. That's why ETC's Showcase School Project, which I described earlier, includes schools in rural and inner-city areas. We are beginning to generate some real-life experiences and, hopefully, solutions will follow. We all have more work to do in this area. However, if we can continue to have an honest, open dialog, I am convinced that we can realize our common goals.

Senator ROCKEFELLER. Good. Thank you very much.

Mr. Jupin.

STATEMENT OF DAVID W. JUPIN, GENERAL MANAGER OF NETWORK SYSTEMS, COMSAT RSI

Mr. JUPIN. Good morning, Senator Rockefeller. My name is Dave Jupin. I am general manager of COMSAT RSI Network Systems, which is a major provider of satellite-based communication systems around the world. I want to thank you for the opportunity to testify this morning on the role of distance learning and, specifically, the use of satellites for this application.

In the interest of time, I would like to summarize the written testimony that was submitted to the committee.

Much has been written in recent years about the educational disparity in America and the drain that places on our economy. Without a doubt, the economic opportunities of tomorrow depend greatly on the educational tools of today. That is why at COMSAT RSI we are both proud and excited to be making a contribution to extending the use of distance learning here in the United States.

We believe that distance learning, particularly through the utilization of satellite technology, offers educators and students a great equalizer. No longer are the availability of curricula and educational materials dictated by the location of a school district. Instead, with the purchase of satellite receiver system, which may cost as little as $3,000, a school can suddenly tap into the best resources in the country.

It is easy to see the impact this technology can have both in the inner cities and rural America. Instructors and students in the most remote parts of West Virginia, Montana, or South Dakota can be linked with classes in New York, Dallas, or Los Angeles. Through distance learning, satellite links and video compression have begun to replace buses and car pools and are transforming our global village into a global classroom.

We at COMSAT RSI have seen firsthand how distance learning can bring States together and improve their educational systems. We have provided many systems across the United States—in fact, over 15,000 systems to date in elementary schools, primary and secondary schools, vocational schools, even in prisons—to help students become more educated.

But this technology is also not just limited to educational institutions. Businesses have also come to appreciate how distance learning enables them to provide employees with continuous and up-to-date training. As our economy becomes more global and races to stay ahead of the pack, the ability to maintain a highly trained work force is a critical factor.

An example of how we have provided training and education to businesses is our partnership with the U.S. Chamber of Commerce. Since the Chamber started its Quality Learning Services in 1992, seminars covering a wide range of training, including management, employee relations and use of PC's, have been delivered via our satellite systems to universities, chambers of commerce, business and government agencies.

But all this just begins to scratch the surface. It is not hard to foresee the day when people everywhere will be linked together in a giant virtual classroom. We believe satellite technology is uniquely positioned to create such a borderless network. Because the costs and logistics make it impractical to expand wideband video communication via fiber to many locations, satellites are often the technology of choice. Use of satellite delivery for distance learning applications has proven to be cost-effective and reliable.

Moreover, advances in the technology, such as digital transmission and video compression, have greatly improved the quality of the video delivery, while further reducing the cost. To illustrate some of the advantages that satellites offer I would like to briefly describe two projects.

The first is with the Commonwealth of Virginia, where COMSAT RSI implemented a digital distance learning network last year that is being leased back to the State at rates that are very cost-effective compared to other technologies. The network was installed with three video uplink sites—one in Virginia Tech, one at Old Dominion, and the third at the University of Virginia, and multiple downlinks throughout the State.

Virginia had been utilizing satellite distance learning for over a decade before COMSAT RSI's involvement. An analog satellite communication system had initially been installed to bring the nationally rated graduate and doctoral engineering programs of the relatively rural universities I just mentioned to students and businesses throughout the State. Over the years, the network has expanded to deliver MBA courses and graduate education courses to high school teachers. The programming was made available to every high school in the State that wished to participate.

By using satellite as the distribution vehicle, the Commonwealth was able to provide equal access for every student in the State. The success and popularity of the original network eventually put too much demand on the analog transmission system. But when Virginia looked to purchase the hardware necessary to convert to the newer digital technology, it discovered there were time and money constraints. As a result, the Commonwealth entered into an agreement with COMSAT

RSI to construct and operate a digital satellite system that would be leased back to the State.

The new, fully automated system that COMSAT provided improved the quality of the video distribution, offered six dedicated video channels, and provides instruction for an estimated 5,000 students at 49 sites within the State and 11 other States.

Senator ROCKEFELLER. And that would just be using a part of a satellite?

Mr. JUPIN. That is right, just one transponder on a satellite. In fact, it is not even a full transponder.

The network also is being used to broadcast secondary education programming that originates in Virginia to out-of-State sites.

The second project demonstrates the truly boundless potential of satellite technology. In 1994, we linked Texas A&M University with the African nations of Zimbabwe and Kenya in a historical exchange of information. The project, which was in honor of former Congressman Mickey Leland, provided three-way interactive video and audio. This allowed government officials, faculty, and students from all three countries to simultaneously present and discuss topics ranging from agriculture to literacy.

The success of the initiative was unquestionable. The project demonstrated the capability of American institutions of higher education to reach out to developing nations throughout the world. At the same time, students in the United States were able to gain valuable insight and knowledge from another part of the world which would otherwise not be possible.

In conclusion, with the rapid advances in satellite communication technology, there is no limit to the future of distance learning and what it means for all of us. We at COMSAT RSI are confident that satellites will continue to serve the needs of educators, business and consumers well into the next century.

Thank you, and I welcome any questions you might have.

[The prepared statement of Mr. Jupin follows:]

PREPARED STATEMENT OF DAVID JUPIN, GENERAL MANAGER OF NETWORK SYSTEMS, COMSAT RSI

COMSAT RSI is a major builder and provider of satellite-based communications systems around the world. The company has been in the business of distance learning since the mid–1980's.

Distance learning offers educators and students a great equalizer. No longer are the availability of curricula and materials dictated by the location of a school district. With the purchase of a single satellite receiver—which may cost as little as $3–4K—a school can tap into the best resources in the country from any point on the map.

COMSAT RSI has been involved in a number of distance learning projects around the country. For Channel 1, over 10,000 systems were installed in the U.S. In Indiana, CRSI designed and installed a satellite network in over 400 sites to provide higher education courses. In Kentucky, CRSI did the same thing for the primary and secondary schools. In Florida, satellite receiving systems were installed to bring education to the prisons. CRSI built other networks in Michigan, New Mexico and Virginia.

Distance learning has also been utilized by businesses. In a partnership with the U.S. Chamber of Commerce, CRSI has delivered over 60 seminars to universities, local Chambers of Commerce, business and government agencies. CRSI has also installed systems for General Motors, Caterpillar, G. Heilman Brewing Company and nearly 80 airports around the country.

Satellite technology is uniquely positioned to create a borderless network. Because costs and logistics make it impossible to extend wideband video communications via fiber optic cables to many locations, satellites are often the technology of choice. In the last 5 years alone, CRSI has designed and installed well over 10,000 distance learning downlink sites for a wide variety of institutions nationwide.

Satellite delivery of television programming, including distance learning applications, has long been proven to be cost effective and reliable. Moreover, advances in technology such as digitalization and video compression have greatly improved the quality of the video delivery while also reducing the costs. CRSI is confident that satellites will continue to serve the needs of educators, businesses and consumers well into the next century.

Good morning Mr. Chairman, members of the committee. My name is Dave Jupin. I am General Manager of Network Systems for COMSAT RSI, a major builder and provider of satellite-based communications systems around the world. I want to thank you for the opportunity to testify today on an initiative that I believe has already begun to change the way people live, work and learn.

In recent years, authors such as Charles Murray have written about the educational disparity in America and the drain that places on our economy. Without a doubt, the economic opportunities of tomorrow depend greatly on the educational tools of today. That's why at COMSAT RSI we're both proud and excited to be making a contribution to extending the use of distance learning in the U.S.

I believe that distance learning, particularly through the utilization of satellite technology, offers educators and students a great equalizer. No longer are the availability of curricula and materials dictated by the location of a school district. Instead, with the purchase of a single satellite receiver system—which may cost as little as $3–4K—a school can suddenly tap into the best resources in the country from any point on the map.

It is easy to see the impact this technology can have in both the inner cities and rural America. Instructors and students in the remotest parts of Montana or South Dakota can be linked with classes in New York, Dallas or Los Angeles to share information on the latest in medical, computer or agricultural technologies. Not only will this increase the knowledge base of these areas, but it will also deepen the understanding between regions. Through distance learning, satellite links and video compression have begun to replace buses and carpools and are transforming our global village into a global classroom.

We at COMSAT RSI have seen firsthand how distance learning projects can bring States closer together and improve their educational systems. For Channel 1, we installed over 10,000 systems throughout the U.S. In Indiana, we designed and installed a satellite network of over 400 sites to provide higher education courses throughout the State. In Kentucky, we did the same thing for the primary and secondary schools. Based on the success of the first phase of this project, we were asked to extend the network into vocational schools, reform schools, public libraries and parks. In Florida, satellite receiving systems were installed to bring education to the prisons throughout the State. By using these systems, inmates can attend remedial classes and earn their GEDs. We've also built networks in Michigan, New Mexico and Virginia, the last of which I will discuss in more detail later.

But this technology is not just limited to our educational institutions. Businesses have also come to appreciate how distance learning enables them to provide employees with continuous and up-to-date training. As our economy becomes more global and races to stay ahead of the pack, this ability to maintain a highly trained workforce is a critical factor. An example of how we've been able to provide training and education to businesses is our partnership with the U.S. Chamber of Commerce. Since the Chamber started its Quality Learning Services program in 1992, over 60 seminars have been delivered via our satellite systems to universities, local Chambers of Commerce, businesses and government agencies. These seminars have covered issues ranging from management training, use of personal computers, employee relations and marketing.

In addition, we've worked with General Motors to install over 3,000 systems in their dealer training rooms across the U.S., Canada and Mexico. We've also installed systems for training at Caterpillar, G. Heilman Brewing Company and nearly 80 airports around the country, including Kennedy and LAX.

But all this just begins to scratch the surface. It is not hard to foresee the day when people everywhere will be linked together in a giant, virtual classroom. And satellite technology is uniquely positioned to create such a borderless network. Because costs and logistics make it impossible to extend wideband video communications via fiber optic cables to many locations, satellites are often the technology of choice. In the last 5 years alone, we have designed, delivered and installed well over 10,000 distance learning downlink sites for a wide variety of institutions nationwide. Although there were some initial issues associated with operating a new system, satellite delivery of television programming, including distance learning applications, has long been proven to be cost effective and reliable. Moreover advances in technology such as digitalization and video compression have greatly improved the quality of the video delivery while also reducing the costs. We are confident that satellites will continue to serve the needs of educators, businesses and consumers well into the next century.

To illustrate some of the advantages that satellites offer, I would like to briefly describe two of our projects. The first is in the Commonwealth of Virginia, where COMSAT RSI implemented a digital distance learning network that is being leased back to the State at rates that are very cost effective when compared to other technologies. The network was installed in 1995 and includes 3 video uplinks, 1 each at Virginia Tech, Old Dominion and the University of Virginia and multiple downlinks throughout the State.

Virginia had been utilizing satellite distance learning for over a decade before COMSAT RSI's involvement. The impetus for the initial program came primarily from the business and industrial community, which wanted graduate engineering in the most populous parts of the State. The Commonwealth had two well-established and nationally rated graduate and doctoral engineering programs; unfortunately, the campus locations were in relatively rural areas which were not easily accessible to the employers who desired the degree programs for their employees. After studying a number of alternatives, it was decided that satellite technology was the best way to distribute coursework statewide, and later nationwide.

An analog satellite communication system was put into place that over the years was expanded to deliver MBA courses and graduate education credits to high school teachers. Also, programming was made available to every high school in the State that wished to participate. By using satellite as the distribution vehicle, the Commonwealth was able to provide "equal access" for every high school student in the State.

The success and popularity of the original network eventually put too much demand on the analog transmission system. But when Virginia looked to purchase the hardware necessary to convert to the newer digital technology, it discovered that there were time and money restraints. As a result, the Commonwealth entered into an agreement with COMSAT RSI to construct and operate a digital satellite system that would be leased back to the State. The new, fully automated system that COMSAT RSI developed improved the quality of the video distribution, offers a larger number of channels, and is cost effective. It also eliminates what had probably been the greatest operational problem with the analog system-operator error. With the new digital system the downlinks are automatically controlled, as opposed to manually operated, to set the proper channel for the courses which means no more last minute calls asking "Where's the video channel I can't see anything on my TV."

The new system, which uses 6 dedicated channels, provides instruction for an estimated 5,000 students, including 2,800 off-campus at 49 sites in 11 different States.

Secondary education programming originating in Virginia is also being broadcast to out-of-state sites.

The second project demonstrates the truly boundless potential of satellite technology. In 1994, we linked Texas A&M University with the African nations of Zimbabwe and Kenya in an historical exchange of information. The project, which was in honor of former Congressman Mickey Leland, provided three-way interactive video and audio. This allowed government officials, faculty and students from all three countries to simultaneously present and discuss topics ranging from agriculture to literacy.

The success of the initiative was unquestionable. The project demonstrated the capability of American institutions of higher education to reach out to developing nations throughout the world. At the same time, citizens of the United States were able to gain insight and knowledge from a different part of the world.

Other international distance learning networks are also being pursued to bring American educational courses from universities, as well as primary schools to students in Puerto Rico, Africa and Europe. This can be of great benefit to the countries in the areas of medicine, agriculture and economics.

In conclusion, there is no limit to the future of distance learning and what it means for all of us. With advances in satellite communication technology rapidly expanding opportunities, a world of information is now only a television set away.

Thank you and I welcome any questions you might have.

Senator ROCKEFELLER. Mr. Swearingen.

STATEMENT OF CARL E. SWEARINGEN, PRESIDENT, GEORGIA BELLSOUTH TELECOMMUNICATIONS, INC.

Mr. SWEARINGEN. Chairman Burns, Senator Rockefeller, thank you for the opportunity to be with you today.

As the president of BellSouth's telecommunications operations in Georgia, we are very much involved in distance learning and, obviously, the advances in communications. But I also have the great honor to serve as Governor Miller's Advisory Council Chairman on Science and Technology Development, and the National Advisory Chairman of the Museum of Aviation at Robins Air Logistics Center. All of these, while diverse, are quite interested in expanded learning opportunities.

I am also thrilled to be at the table with Pat Wright, the former principal in Carrollton City Schools and outstanding member of the Georgia community, who ushered in distance learning in the late eighties. Pat, it is good to see you again.

BellSouth is an ardent supporter of education.

Senator ROCKEFELLER. That is a heck of a compliment.

Mr. WRIGHT. Thank you very much.

Mr. SWEARINGEN. He is a heck of a guy, Senator.

Senator ROCKEFELLER. You better get him lunch. [Laughter.]

Mr. SWEARINGEN. He is a heck of a guy.

We were thrilled to have our chairman, John Clendenin accompany Governor Miller to the National Governors Summit on Education. At that, as we all know, critical areas involving telecommunications technology were discussed.

Yesterday, we unveiled our digital network that will support the Olympic Games that will be in Atlanta in just 86 days. To see Izzy, the character of the Olympics moving across a digital screen, changing venues, capturing the attention of every child and every adult is just but one application of technology.

The day before, I stood in a telemedicine lab and saw practitioners and the president of the Medical College of Georgia tell us that the efficiencies of nurses and technologists could be increased 4 to 5 times with telemedicine capability. On Monday, school kids across Georgia visited the zoo as we celebrated Earth Day over the Distance Learning Network.

BellSouth's commitment to education is very strong, as evidenced by over $239 million in contributions and grants, donations and services, and some $136 million in discounts available to educational institutions; $16.5 million has been invested in distance learning trials in the last 5 years across our nine States.

Let me share with you just a few of the highlights in the States, to let you see that BellSouth has been actively involved in education and the application of telecommunications technology. It was Mississippi's FiberNet 2000 which began in 1991, that was the first distance learning project to be switched over to the public network. Today, that network serves students in 15 high schools, 2 universities, and provides access to the Mississippi Educational Television Network. Courses like Creative Writing, Psychology, German, Fine Arts, and World Geography are part of that curriculum.

In North Carolina, Governor Jim Hunt has led a public/private partnership that is very, very strong. It is exemplified by their Information Highway which became operational in August 1994. High-speed phone lines hook up kids across 120 sites, from the coast to the Appalachian Mountains. Public safety, economic development and, yes, even video arraignment are part of this information highway.

In Louisiana, high-speed access circuits hook up the Louisiana Educational Network. Over 2,000 public and private educational institutions are involved in this particular activity.

In Kentucky, it is the TeleLinking Network, enabling thousands of students to receive courses previously unavailable to them—courses in math, physics, statistics, and social studies.

Alabama was given the challenge of providing more degree programs, more classes, but with fewer dollars. It did that with the Intercampus Interactive Telecommunications System. The University of Alabama met the challenge.

In Tennessee, a strong leader in ISDN technology, the Department of Education now has Internet connections to every public school in the State. We have been working there together since 1990.

Just last week, BellSouth announced, with the Levi Branch of the Memphis-Shelby County libraries, access to the Worldwide Web. Over 22 sites in the Memphis area will be hooked for access to Internet.

In South Carolina, the State Technical College Board will soon launch 18 technical colleges on distance learning to provide education and training to employees of local businesses.

In Georgia, my home State, we have an extensive, far-reaching distance learning and telemedicine network. It started in 1991. Our champion has been Governor Zell Miller. The U.S. Secretary of Education, Richard Riley, has been a frequent visitor and participant. We have 300 distant learning sites and 46 telemedicine sites in Georgia, two-way interactive, voice and audio. There have been 16,000 classes, conferences and consultations involving more than 40,000 locations since 1991, impacting over 400,000 people.

In Florida, the students in Palm Beach County are studying calculus, social studies, and French together over their fiber optic distance learning network.

In less than 86 days, the 1996 Centennial Olympic Games come to America. The torch is on the way. To think about the advanced, state-of-the-art technology that will be deployed is thrilling. But every second, over 100 billion bits, 100 billion bits of information can move in and out of the International Broadcasting Center, to be processed through the NBC network, and then sent out to the world. To put that in perspective as to how we use the bit rate today, it is 44 SONET state-of-the-art fiber rings, 600 video circuits, 1,000 ISDN lines, and enough fiber to circle the globe 16 times.

To ensure the rapid development of telecommunications and its application in education, we applaud and salute Chairman Burns, you, and your colleagues, for the leadership in the Telecommunications Act of 1996. Like the Act of 1934, universal service is a cornerstone. We believe it is critically important that all who participate in this new era and who strive to reap the benefits certainly should participate in supporting the universal service fund.

We are at a crossroads, but I must tell you that there is nothing more thrilling than to see a young man who lived in an area where 40 percent of his neighborhood was at or below the poverty level, was the operator of a distance learning network, and the sole participant in a French class. Today, he is enrolled in college, studying political science and French. His teacher told me on Monday that he is well on his way to being a very strong citizen in his area.

We can have definite impact. I have been in the classrooms. I have been in the hospitals. I know it works.

Thank you.

[The prepared statement of Mr. Swearingen follows:]

PREPARED STATEMENT OF CARL E. SWEARINGEN, PRESIDENT, GEORGIA BELLSOUTH TELECOMMUNICATIONS

Good morning. I am Carl Swearingen, president of the Georgia Operations for BellSouth Telecommunications. I also serve as chairman of Georgia Governor Zell Miller's Advisory Council on Science and Technology Development, and on several other boards including the University of Georgia Foundation, Chairman Elect of the Georgia Partnership for Excellence in Education, and Chairman of the National Board of Advisors for the Museum Aviation at Robins Air Logistics Center.

I would like to thank you for the opportunity to appear before you today, and congratulate you on the passage of the Telecommunications Act of 1996, a truly landmark piece of legislation, signed into law on February 8, 1996 by President Clinton.

BellSouth is an ardent supporter of education, and we are excited that our Chairman, John Clendenin, along with our Governor, Zell Miller, joined other national leaders in the National Governors Association Education Summit in Palisades, NY. This summit focused on many critical areas, including the application of technology in the classroom.

BellSouth's commitment to education is evidenced by educational support of $239 million over the last 5 years. This support includes over $103 million in grants, donated products and services, and employee contributions to elementary and secondary education. It also includes over $136 million in savings-on telecommunications services through available discounts to educational institutions in our nine southeastern States.

As a strong advocate for improvement in education, BellSouth has utilized its advanced telecommunications network to enhance educational opportunities across the southeast. We have also applied these same technologies to bring dramatic improvements to healthcare in the new field of telemedicine, and to strengthen economic development initiatives in the States we serve.

During the first half of this decade, BellSouth invested over $16,500,000 in distance learning trials across our nine States. In some cases these trials provided students with the opportunity to "attend" advanced or specialized classes previously offered only at other schools. As a result, enhanced educational opportunities are already becoming realities for students throughout our region.

Let me share a few of our distance learning thoughts:

In *Mississippi*, BellSouth has been a pioneer in distance learning. Its first distance learning trial was Mississippi's FiberNet 2000, which began in 1991 and was the first distance learning project to be switched over the public network. FiberNet 2000 now serves students in 15 high schools, two universities, and provides access to Mississippi Educational Television. With the help of this distance learning network, students study Creative Writing, Psychology, Legal Education, German, Fine Arts, World Geography, Trigonometry, Probability and Statistics, Latin, and other courses.

In *North Carolina*, public/private partnerships are exemplified by the North Carolina Information Highway (NCIH) project, which became operational in August 1994. Via high-speed phone lines, this first-of-its-kind project enables high school students in two small coastal towns to study advanced math with their classmates and the master teachers, who are several hours away at The North Carolina School of Science and Math in the Research Triangle Park. NCIH distance learning, telemedicine, video arraignment, public safety and economic development applications are being used statewide to over 120 sites.

Also in North Carolina, BellSouth has been a sponsor of the VISTAnet project since 1991 using advanced switching on a broadband network. The project is being used to develop improved treatment plans for cancer. The network provides high resolution images (of malignant tumors) and radiation dose patterns that enable specialists to optimize radiation treatment plans (by exploring thousands of possibilities) in real time, a process that otherwise takes several days.

In *Louisiana*,? BellSouth provides high-speed access circuits to the Louisiana Educational Network for over 2,000 public and private educational institutions. Students linked to this network enjoy access to information experts, teachers and peers who can enhance their learning and increase their awareness of other people and places.

In *Kentucky*, the Kentucky TeleLinking Network (KTLN) enables thousands of students to receive courses that would not otherwise be available to them. Through a two-way video network, universities deliver courses to community colleges and to high schools. The network also lets school districts share qualified teachers across geographical areas to deliver language, math, physics, statistics and social studies courses.

In *Alabama*, the first distance learning initiative grew out of a challenge to meet the demand for increased degree programs and more classes with reduced budgets. The Intercampus Interactive Telecommunications System (IITS) enabled the University of Alabama to meet that challenge. Now, resources are shared via two-way interactive video sites at several educational institutions.

Also, BellSouth has partnered with the University of Alabama at Birmingham (UAB) to develop a new pathology image system that uses high-speed telephone lines to visually connect patients at outlying hospitals with pathologists at UAB Medical Center. With the UAB-BellSouth Anatomic TelePathology Applications Research Project, remote robotics and medicine are combined to allow personnel at outlying hospitals to examine suspect tissue on a slide that can be immediately viewed by pathologists at UAB.

In *Tennessee*, BellSouth is working with the Department of Education to provide Internet connections for every public school in the State, using ISDN technology. We've also had a growing distance learning network there since 1990.

And, just last week BellSouth announced public access to the Internet from the Levi Branch of the Memphis/Shelby County Tennessee Public Library and Information Center. It is the first of twenty-two Memphis area locations to provide public access to the Internet, via a World Wide Web Browser. Internet access is no longer limited to those who can afford to own a personal computer; from the library, anyone in the Memphis area can obtain access to the information superhighway using BellSouth's state-of-the-art telecommunications network.

In *South Carolina*, BellSouth will soon turn up a distance learning application, sponsored by the State Technical College Board, and developed as an education/business partnership. Initially, 18 technical colleges will use BellSouth's distance learning network to provide education and training to employees of local businesses. The businesses will rely on the distance learning network to help provide a well-trained workforce. Continuing Medical Education (CME) for allied healthcare workers will also be provided using this network.

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In *Georgia*, a public/private partnership has helped build an extensive, far-reaching distance learning network, started in 1991. ?The Georgia statewide Academic and Medical System (GSAMS) was championed by Governor Zell Miller. US Secretary of Education Richard Riley has been a frequent participant. With nearly 300 distance learning and 46 telemedicine sites in Georgia, the GSAMS network provides two-way audio and video interaction, allowing students and teachers, doctors and patients, to share information statewide. The network has already completed 16,000 classes/conferences/consultations involving more than 40,000 locations. I can assure you these applications work -I've been in the classrooms and in the hospitals.

In *Florida*, high school students in Palm Beach County study calculus, social studies, French and Spanish together across a fiber optic distance learning network. This same network is also used for staff development activities. And in nearby Dade County, an ISDN-based distance learning network enables students at the Coral Park Senior High School Engineering Magnet to take engineering classes with college students at the Florida International College of Engineering.

BellSouth's contribution to education is enhanced with the 100,000 active and retired employees across our region who volunteer over 8 million hours of service and raise over $25 million annually to serve their communities. Much of their service is devoted to education initiatives. Additionally, our employees tutor, mentor, and provide school-to-work transition activities for students.

We also recognize that BellSouth—like all businesses-depends on schools to develop a competent workforce that can continue to learn and adapt to new technologies and new workplace strategies. An improved level of education is an absolute necessity if America intends to maintain itself as a serious competitor in the global marketplace.

BellSouth believes that business has a fundamental responsibility to prepare young people for work. BellSouth has invested almost $1 million in its "BellSouth Connections: School-to-Work Program." We helped develop courses that are oriented toward work-based learning, thereby exposing students to current and practical workplace issues. Distance learning technologies could truly impact the reach of this program in a dramatic fashion.

In less than 86 days, the 1996 Centennial Olympic Games will be held in Atlanta. As a proud sponsor, BellSouth has built the most advanced telecommunications network in the world, including the latest in both wireline and wireless technology, to carry the excitement of the Games. Every second, more than 100 billion bits of information—four times the entire contents of the Encyclopedia Britannica—can move in and out of the International Broadcast Center over the BellSouth network. That network includes 44 state-of-the-art SONET fiber rings, 600 video circuits, more than 1000 ISDN lines and enough fiber to circle the globe 16 times.

This same exciting technology can be in classrooms all across America.

However, America is at a crossroads. We cannot afford to let the momentum we have built in educational improvements be slowed.

Educational equity and a well-educated and well-trained workforce are by-products of distance learning.

To ensure rapid deployment of telecommunications technology occurs at reasonable rates for all citizens, the rules governing the implementation of the Telecommunications Act of 1996 must be fair. Universal service is the cornerstone of the 1934 Communications Act and the 1996 Telecommunications Act. The educational support enabled by the universal service provisions of the Act must be supported by all who seek to participate in this new era, and who stand to benefit by the opportunities made available by the Act. We ask your assistance in ensuring the process remains focused on the applications and opportunities provided by your leadership.

The educational provisions of the Act's Universal Service Fund hold the promise of connecting schools to the information highway. But connection is just a piece of the promise. Hardware, software and teacher training are required components of making the educational promise a reality for our children.

The road to personal success has often been described as the road of learning and formal education. In the past, instruction most often came from books. Increasingly, it now comes from the information highway, using tools like the Internet and electronic commerce.

With the passage of the Telecommunications Act of 1996, BellSouth can now explore these vast information resources.

BellSouth has the technology and is ready to deliver the applications of the future to the school, the home and the workplace.

Thank you.

Senator BURNS. Thank you, Mr. Swearingen.

I want to ask a general question to this panel. Also, thank you for coming. I am sorry I had to step out for a little bit. We are appropriating money for the Forest Service. We still have a forestry program in Montana, too. Last year I introduced S. 1278, which is a bill that was to establish a loan for an educational satellite. It was a guaranteed thing. It went through the Commerce Department. The bill was intended to address some of the concerns that Ms. Weinstein had this morning of educational programming having difficulty getting transponder time and this type of thing.

I would just like to know what your opinion of that type of a program is. We know that we are short of money. Of course, I do not care if it is a loan program, it is still scored as a outlay as far as this government is concerned. Give me an idea of the availability of satellite services for educational services. Do we need this program or do we need to redesign and go in another direction to fulfill the needs that maybe Ms. Weinstein would have?

Ms. Weinstein, you might want to comment on that, and then anybody else can chime in, too.

Ms. WEINSTEIN. Well, thank you very much, Senator.

As you know, the answer is yes, we do need the program. The distance ed community needs the program, both for the short term, as I testified to, but, equally as important, to establish an adequate system. I would like to address it in the sense not only are we about to lose the distance ed providers as they exist in these small businesses, because of their structure and shape, as I earlier had said, aggregated, they are equal to the commercial sector in use and size, in numbers of hours and in spending. However, they buy independently, they demand and need it for teaching and learning.

While all of our pipelines have grown out of the telecommunications industries, *i.e.*, broadcast, *i.e.*, voice, we have a major industry as a part of the information economy, and that is teaching and learning. That is instruction, education, information, and training. We need to think about how we structure those pipelines. It must be a partnership with cable, satellite, and telephone lines. It will not happen without a public/private partnership.

However, there are three questions that the Governors, the State institutions, the school districts, and educators must ask when they make the consideration of which technology. I believe the faculty gentleman from the University of Maine touched on it, and it is very critical. What are the capabilities of that technology? How are we going to apply it in a school that is accredited, in the classroom that uses and demands it in a different time and in a different form? And what is the cost-effectiveness of it?

I would mention two things. I believe that many of our providers welcome, whether it is TCI and ETC, whether it is BellSouth offering fiber link, they welcome this competition, what they need immediately is evening up this playing field. Because they are occasional users, they are charged costly and unpredictable services in the satellite industry. They are charged on a basis in the telephone industry on bandwidth, on distance and on numbers. These are frequently incompatible with our public education missions.

So, if you ask those three questions, the answer is yes, we need it. The cornerstone of an open, accessible and equitable highway is indeed the space segment. We then need it interconnected—and these cannot happen separately—with existing infrastructure, with the new that is yet to come, and it needs to be state-of-the-art so that it is cost-effective, so that our State legislators, our Governors and our school districts see that it is absolutely essential that they make the State and local investments in the infrastructure for the schools.

Mr. JUPIN. I have reviewed the bill, and I think it is an exciting proposition. I do want to state that in the use of satellite distribution for distance learning the satellite capacity is a very large expense, recurring expense, and in fact, as was stated, many of the institutions are competing with larger businesses for this capacity, so the availability and affordability is very constrained.

What we call the ad hoc users, generally they do not require a transponder 24-hours a day but rather a few hours per day 5 days per week, so because using a small amount of capacity and for a shorter duration of time, the per-hour expense is quite a bit more. Pooling resources, of course, would help that, but there needs to be something done so that the availability is there.

Also, as was mentioned in the bill, having the distance learning transmissions spread across multiple satellites makes it more expensive for schools because they need to be able to then move the antenna and scan across several different satellites to get the availability of different distance learning programs, but it is not just a long-term problem, but also a short-term one, launching a satellite will take a few years before it would be available.

There needs to be some sort of short-term solution, as was mentioned, so that the institutions can have access to satellite capacity, and I believe something should be done with business to help provide capacity in a fair, reasonable manner, because it is a great benefit to our society, and it is certainly something that needs to be addressed.

Senator BURNS. Does anyone else want to comment?

Mr. SWEARINGEN. Mr. Chairman, we are very fortunate in Georgia. Every public school has a satellite dish, 1,700, and so it is very important to our educational effort as we reach across the State.

But we have also found, since the Telecommunications Act of 1996 was signed and enacted, there is more than one provider of local service. In my State alone, I have six competitors who are certified to provide that link. I have 15 standing by to be certified.

We have melded our rates, we have reduced our cost, we are very sensitive to the needs of that uplink and to sharing that capacity, but I think there will be more in the marketplace who will be able to provide the user a chance to have more of a competitive edge. We are very sensitive, but are also very thrilled to know that our children can reach across to whatever continent or whatever State and share the benefit of satellite education.

Mr. WRIGHT. Let me just respond.

Senator BURNS. It is nice to see you, by the way. I am glad you are here.

Mr. WRIGHT. Thank you. It is a pleasure to share some ideas.

I was mentioning when you left that ETC, the company that TCI has just formed, one of their first initiatives is to address this problem that schools face in acquiring satellite equipment for every site. It is an expensive proposition whether the school takes it on individually or through a well-planned strategic effort like Georgia and some other States have followed.

What we have tried to do is to collaborate with the institution. For example, we have entered into a partnership with Northern Arizona University, where we will be offering or delivering the three courses in elementary Spanish that is offered by that institution via the Learning Channel. Sixty one (61) percent of the Nation's schools and 42 million homes currently receive the Learning Channel. Here is a way to get real time programming, distance learning with scope and sequence, all of the support materials, to schools without the school having to face the enormous challenge of acquiring the equipment and coordinating it, and usually in a lot of cases relocating students to get to the spot in the school where the signal is coming in.

Those are one of the things, and again, it is to leverage an existing infrastructure while we still look at the enormous problems of penetrating even more deeply into the school with infrastructure.

Senator **BURNS**. Let me ask, on EDSAT, how many companies do we have out there offering educational television on satellites right now? How many do we have?

Ms. **WEINSTEIN**. On distance ed you have got over 200, what would fall in the category of small—when I call them businesses, they are colleges. Ninety of the colleges offer it, but add together your school districts—you heard from Glen Kessler earlier in the day. Fairfax School District is one of our biggest domestic and international deliverers. We even include in that the larger ones, but that is—for example, TCI mentioned Discovery Channel, Learning Channel. These are all members of our organization.

Any organization, small or large, that is delivering information and programming into a U.S. classroom for education and instructions should—will benefit from colocation of an education satellite, because that means that a teacher in Montana that may be in a very rural school district—I only know you have a few of them, Senator, but who may be there, and somebody sends them a fax, which maybe they have, that says tomorrow your coordinates for your signal have just been changed, cannot go out and move an immobile dish that is very fixed and not yet steerable, let alone that these programmers are split between C-band and Ku-band.

They have alone—major Federal agencies, all defense education and training programs go across commercial satellites. They do not use the military national security system. They are in the same distress, I might add, at the moment, in delivering to both their camps for training and retraining continuing education as well as into the communities.

So you have got a very large number of program providers who, in their way, are equivalent to the ETC's, to the equivalent of the Bell South that is delivering this, and they do not mind that competition. Just do not close off the pipe and give them colocation to a cornerstone of their delivery system.

Senator **BURNS**. But how many satellite companies do we have offering services on satellite time?

Mr. **JUPIN**. Well, domestically it is primarily AT&T, Hughes, and GE that have the domestic capacity.

Senator **BURNS**. And are they full?

Mr. **JUPIN**. They are very full at present. There have been a few launch failures in the last year or so, and although there are several launches that are imminent, many of those satellites are already booked.

Ms. **WEINSTEIN**. Senator, if I could just add to what the gentleman is saying from COMSAT, there is no prelaunched, planned launched satellite that is not totally booked, and for those that were up there when the shortage hit, when Hughes' satellite set the benchmark, so to speak, of raising the cost of occasional use—for example, Senator Rockefeller and yourself were concerned about health education. We have Texas Tech Healthnet from the University of Texas technology, the biggest rural health provider in the United States for professional client patient training and paraprofessional within 30 days' time, because they are occasional users, were advised you are off your transponder in the month of May.

They still had major training programs. You cannot have the preemptibility. They are horizontal, and need that capacity so that their demands and needs as education and training are met, and the point is, we have no unused capacity, for all intents and purposes, for occasional users.

Senator **BURNS**. Let me ask Mr. Jupin, the new Earth low-orbit satellites that are going up now, are they good?

Mr. **JUPIN**. They are good for the application that they are designed, more for mobile hand-held communications as opposed to wide bandwidth video distribution. It would require tracking antennas for use for video.

Their design is, because they are low orbit, to be able to be used more for hand-held omnidirectional antennas, low power, but for video it probably would not be a real good application for that at present.

Senator **BURNS**. You have pretty much answered—in your statements answered most of my questions. I have no more questions. Your full statements will be added to the record, and thank you for that.

Also, if we have more questions from the committee, or any member of the committee, we might address them to you and you can respond both to the individual Senator and to the committee.

Senator **BURNS**. We appreciate your coming here today. I think this has been a very, very informative meeting and hearing on an idea that was just an idea not too long ago, and I thank you for your cooperation. I also thank you for your dedication to education. It shows a real willingness on the part of your organizations, and I really appreciate that very much.

Thank you for coming today. I am going to recess these hearings, and the record will remain open.

Thank you very much.

[Whereupon, at 12:20 p.m, the subcommittee adjourned.]

APPENDIX

PREPARED STATEMENT OF SALLY M. JOHNSTON, DIRECTOR, WESTERN COOPERATIVE FOR HIGHER EDUCATIONAL TELECOMMUNICATIONS

Thank you, Senator Burns, for the opportunity to address the Congress on the current issues and practices in the use of telecommunications technologies by educators. As you are aware, the technologies available to educators have evolved at a pace that requires public policies on such matters to be very adaptable and to support the educators as they adapt to the new technologies. Just a few years ago, the standard practice in teaching electronically was to export the classroom using video signals that were carried in "real-time" by cable, microwave, or satellite to remote learning centers sometimes located in rural schools. While this practice is still widespread, there are many other practices that seem more compatible with remote learners whether they are rural high school students or working adults who do not live near a college campus offering them needed new skills.

During the last 3 years, we have had the opportunity to be the outside evaluators on two large projects that brought college classes to the types of remote learners just mentioned. The first of these studies looked at a national project sponsored by the Annenberg/CPB Project known as New Pathways to a Degree. Seven colleges and universities used a wide array of technologies to deliver degree programs to students who did not come to a campus. The second project was sponsored by the California State University and had five Cal State campuses delivering college classes to 25 rural high schools throughout California. In addition to these studies, the Western Cooperative has been brokering degree and certificate programs throughout the western states under a Department of Commerce, NTIA, TIIAP grant awarded in 1994. Six colleges and universities, using various mixes of technology, are reaching over 190 learners in nine states this term alone. The technologies used by the colleges and universities include audioconferencing, real-time video via satellite, prerecorded videotapes, audiotapes, FAX, Internet Relay Chat, e-mail, and WorldWideWeb.

We have been able to learn many lessons from our studies, as well as from our own experience. I will use the information we have gathered to illustrate one of the most critical aspects of reaching people in different places. That is, "real-time" versus asynchronous communication. Exporting a classroom via video works, many more students are able to watch and listen to a teacher or professor lecture. Yet, when you have hundreds of students watching, very few of them ever get a chance to take advantage of the real-time connection to actually ask a question. It is analogous to a lecture hall with many hundreds of students—not the best learning environment. The more successful programs that use this technology have developed other methods of allowing the students to ask their questions. They use an onsite facilitator to answer questions or they link the students and teachers using an asynchronous method of communication, like e-mail or voicemail. I must point out that the original reason for using the real-time, video technology was to allow for student/teacher interaction. When other technologies seem better suited for interaction, I question whether the expense and inconvenience of real-time video is justified.

Let me illustrate this point. In the California project, all but one of the six classes taught used videotapes of the professors' lectures that were mailed to the high schools and viewed at the convenience of the three or four students and their

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facilitator at each school. Discussions were held with the professors and with other students using audioconferencing and/or e-mail. The audioconferences were sometimes difficult because of the real-time aspect to them. They were scheduled at the end of the day to accommodate as many of the students as possible. However, these students at small rural schools could not afford to miss their busses home when the bus trip might be over an hour. Another serious complaint we heard from the facilitators at these schools was that being so small the "best and brightest" were not only taking the college classes, they were also on the sports teams, debate teams, etc. and the students had no time for additional after-school activities.

The use of e-mail for these discussions was quite popular, but unfortunately not every school had high enough quality phone service to allow the students to connect to the e-mail service from Cal State.

While five of these classes used videotapes for the lectures, the sixth class was a live, satellite delivered class. The 25 schools did not have synchronized bell schedules. So in order to see and hear the lectures, many of the students had to miss part of the previous class period and some of the following one. It was not the favored deliver mode.

The quality of the asynchronous interaction is reported to be quite good. Teachers who have been using voicemail and e-mail have reported that the type of questions they get from students are more thoughtful than in a traditional face-to-face setting. They report the same high quality in the answers to the questions they ask of their electronic students. A typical example is from the Annenberg/CPB Project study. In the French class, the students would watch preproduced video segments, complete written assignments and do their recitations through voicemail. When the student was ready he/she would call into the teacher's voicemail box and read the assigned recitation. Within 72 hours the teacher would listen to it and leave a verbal critique. When the student was ready to concentrate on the assignment, he/she would call into the voice-mail system, hear the original version, the teacher's critique and be able to correct it right away. The students reported to us that they had NEVER had such individualized attention from a teacher—from a teacher not one of them had ever seen.

This illustrates another one of the strengths of asynchronous student/teacher discussions. Each discussant is involved in the discussion when he/she is ready to concentrate on the activity. The discussion is not competitive. No one else is trying to get the teacher's attention at that moment. The student can compose his/her thoughts before making the response. He/she also has the chance to self-correct the response before it is "sent" to the teacher by e-mail or voicemail. None of this is possible in a real-time video class.

It is interesting to note that teachers rate the quality of interaction with students in real-time video classes as the same or better than what they experience in face-to-face, traditional classes. They rate the quality of interaction in an e-mail environment as a little less than in a face-to-face class. However, the students do not see it that way. They rate e-mail higher than real-time video for the quality of interaction with their peers and their teachers.

The students seem to recognize that something better is possible in the teaching/learning relationship with these new electronic tools than was ever possible in a traditional classroom that requires everyone to work at the same time and pace. When these tools are used to their fullest potential, we get away from students listening to a single expert talk about or demonstrate something he/she hopes will make sense to all the students at once. The teacher is freed to prepare teaching materials (i.e., video, hands-on kits, computer-based problems) that can be used by individual learners. The individual learners can work with the prepared materials at a pace that makes sense to him/her. A videotaped lecture can be rewound and watched as many times as needed. A computer-based problem can take one student 10 minutes to master, another may need 3 hours. Neither has to be penalized by having to be bored or lost in a real-time explanation given by the teacher to a whole group at once.

The shift to asynchronous technologies can really put the learner in control of his/her learning and achievement. It seems that learners prefer this. The most popular programs in our federally funded project to share electronically delivered learning among the western states were those that allowed the students to use asynchronous tools.

I am currently involved in helping design a virtual university for the western Governors. Their directive is to create an electronic learning and credentialing environment that is learner oriented and helps to develop the market for the learning tools that will allow students to learn where and when they choose. These asynchronous learning tools are quite expensive to develop, but can be used by huge numbers of students over a relatively long period of time. I would hope that Federal policies would support such efforts to allow students greater flexibility in their learning, to allow teachers to become coaches to the students and not fall back into the role of only exporting what they have been constrained to do in a traditional classroom.

For further information:

All the examples used here are from two publications: *New Pathways to a Degree: Technology Opens the College*, Publication #2A247; *Lessons in Accommodations for Colleges and Rural High Schools Linking Electronically*, Publication #2A281. Available from WICHE Publications, P.O. Box 9752, Boulder, CO 80301-9752, 303/541-0290. As part of our work for the western Governors, we have collected a set of "best practices" in the use of technologies to deliver education. This collection of brief case studies from higher education and industry can be obtained from the Western Governors' Association and will be posted on the WICHE website by April 30, 1996 (www.wiche.edu).

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May 14, 1996

Mr. Louis Whitsett
Science, Technology, and Space Subcommittee
Senate Commerce Committee
SH 428
Washington, DC 20510

Dear Mr. Whitsett:

This letter is submitted in connection with the Senate Hearing on S. 1278, Educational Satellite Loan Guarantee Program Act, and Distance Learning, held on April 24, 1996. Please include these comments as part of the official record.

The testimony of the National Education Telecommunications Organization ("NETO") requests that the C-band transponders on NASA's TDRS-6 satellite be dedicated for educational purposes as an interim solution to the shortage of inexpensive satellite capacity. I am writing to provide the Committee with some basic information about Columbia Communications Corporation and the TDRS-6 satellite due to the concern that NETO is not presenting a full factual description of the issue.

Columbia is a certified US small business, with its headquarters located in Bethesda, MD. As an FCC licensed international and domestic satellite system, Columbia has been providing competitive telecommunications services between Europe, North America and Asia since 1992. Under a unique partnership arrangement between NASA and Columbia, Columbia markets to commercial customers the C-band capacity aboard two TDRSS satellites, and shares the gross revenues from such leases with NASA. By the end of this year, Columbia will have generated over $35 million for the government, and by the year 2004, we project that Columbia will have generated over $115 million for the government. (These figures do not include tax payments made by Columbia and its staff.) Please see the enclosed article jointly authored by NASA and Columbia, which was presented at the 45th IAF Congress in Jerusalem (October 1994).

Columbia currently markets capacity aboard NASA's TDRS-4 and TDRS-5 satellites for both domestic and international services over the Atlantic and Pacific ocean regions. Based upon the success of the project, we have been discussing with NASA, for almost two years, plans to begin marketing the capacity on TDRS-6. Columbia has already made substantial investments in preparing for this capacity, and has already obtained commercial customers for this capacity.

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Columbia has also received the support of the FCC, State Department, and Commerce Department in their efforts to foster competition in the international satellite marketplace through the establishment of private satellite systems like Columbia. US policy to encourage the growth of such systems was formalized in 1984 when the White House issued a Presidential Determination that international satellite systems separate from Intelsat are required in the national interest.

Since being awarded the NASA contract in 1990, Columbia has worked very hard to assemble the technical expertise and overall network necessary to succeed. Because of its experience marketing capacity on TDRS-4 and TDRS-5, Columbia is well positioned to maximize the revenues to the US government when the TDRS-6 capacity is marketed. Among other things, Columbia has hired a highly skilled engineering and sales team, has obtained all necessary licenses from the FCC, has been granted critical orbital slots above the equator, has either initiated or completed the international coordination process for these slots, has obtained landing rights in foreign countries, has developed an international network of privately financed antennas dedicated to the TDRSS satellites, has invested in expensive hardware and software for monitoring telecommunications traffic on the TDRSS satellites, and has built a global alliance of strategic partners all working to market the C-band capacity on the TDRSS satellites.

While we have no quarrel with distance education as a deserving cause for congressional attention, we feel that dedication of the TDRS-6 satellite for this purpose presents a substantial number of technical and policy issues that should be considered. When examined closely, we believe these factors lead to the conclusion that the C-band transponders on the TDRS-6 satellite can best be used for commercial purposes which will provide substantial revenues to the US government. NETO's efforts to take control of the TDRS-6 satellite for an educational network reflect a fundamental lack of understanding of the technical aspects of satellite telecommunications technology.

I would like to briefly touch on some of the most important technical matters:

1. Orbital Slots - For geosynchronous coverage of the continental US, a satellite must be placed in an equatorial orbital slot within the domestic arc. There is a shortage of such slots, and the largest domestic carriers in the US have been fighting over them for some time. In addition, NASA has stated that moving the satellite to a slot providing full coverage of the continental US would require a significant movement to the West

and would be inconsistent with NASA's operational plans to use this satellite as a spare for the 41°WL position. Columbia has researched and applied to the FCC for a viable orbital slot for TDRS-6 at 47°WL. The costs associated with the application process have already exceeded $100,000. Columbia has determined that this slot will maximize the revenues from the satellite, and NASA has determined that the 47°WL slot is consistent with NASA's operational plans.

2. Licensing - Operating a telecommunications satellite requires a finding by the FCC that the operator is legally, technically, and financially qualified to fulfill all statutory and regulatory obligations of an FCC license. Columbia expended great effort, resources, and time to become a licensed US carrier.

3. TDRSS Satellites - Each of the TDRSS series of satellites carries a relatively low-powered C-band communications payload. This has significant implications for the design and expenses of any associated ground network. We have found that the TDRSS satellites are better suited for point-to-point contribution feeds between large antennas than for point-to-multipoint distribution feeds directly to the customer's premises, as would be required for an educational network.

4. Ground Network - A satellite is only one component in an overall communications system. Particularly in a point to multipoint network, the ground facilities, which include multiple antennas, electronic equipment, and connectivity are far more significant both financially and technically than the satellite itself. Designing and assembling an appropriate ground network requires technical knowledge and considerable expenditures, particularly for an educational network that may involve hundreds or thousands of receive locations scattered throughout the country. A low-powered C-band satellite like TDRS-6 requires significantly larger and more powerful earth station antennas than most domestic satellites which carry high-powered Ku-band communications packages. Also, C-band frequencies have the disadvantage of presenting more difficult coordination problems due to widespread terrestrial microwave networks throughout the US. Applying these principles to a potential educational network raises problems including the following: (1) Higher expenses for school districts to purchase larger antennas; (2) Space and aesthetic concerns about larger antennas on school grounds; (3) C-band frequency coordination problems for hundreds of sites, which may prevent placement of antennas near schools; (4) Expenses associated with connectivity to antennas located at remote locations.

5. Station-keeping - In order for an antenna to communicate with a fixed satellite, the satellite must be held in geostationary orbit. This operation is one which requires greater on-board fuel consumption and results in a shorter life for the satellite. Because the TDRS-6 is primarily intended by NASA to support government programs like the Space Shuttle, NASA intends to place the satellite in geostationary orbit for less than 2 years. After that, NASA plans to allow the satellite to drift in an inclined orbit. While the satellite would still be capable of providing communications services, all ground stations would require retrofitting with tracking devices which allow the antennas to follow the drift of the satellite. Due to the expense and lower reliability of tracking antennas, inclined orbit satellites are generally not suitable for point to multipoint applications which involve large numbers of receive locations.

6. Monitoring - All carriers who operate satellites like the TDRSS satellites are required by the FCC to set up monitoring facilities to view all communications signals on a 24-hour basis to assure that such signals remain within certain technical parameters and cause no interference into other licensed systems. Columbia has already invested in the hardware and software for such a monitoring station located at Denver Teleport, which could be used for the TDRS-6 operations.

For all of the above reasons, we believe that the TDRS-6 satellite should not be singled out for educational use. Under the partnership arrangement between Columbia and NASA, the TDRS-6 satellite can best be used to provide specific types of commercial services, both domestic and international, to earn significant revenues for the US government. If Congress wishes to support distance education, such support should come in the form of financial aid that would allow organizations like NETO to obtain technical assistance to design an appropriate educational network, and then purchase domestic satellite capacity and other necessary electronic components to fit that network.

Very truly yours,

Kenneth Gross
Chief Operating Officer

Pergamon

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COMMERCIAL USE OF NASA's TRACKING AND DATA RELAY SATELLITE SYSTEM FOR INTERNATIONAL COMMUNICATIONS

by

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Introduction

NASA has an Agreement with Columbia Communications Corporation (Columbia) for use of NASA's Tracking and Data Relay Satellite System (TDRSS) C-Band payload services for international communications. It is an important step for NASA in keeping with three objectives: (1) valuable resources should not be wasted; (2) promote competition in the communications satellite industry by fostering an environment that would enable a small business to enter the market; and (3) provide monetary return to the taxpayers for their investment in the TDRSS.

This paper presents the unique relationship between NASA and Columbia, through which the same Tracking and Data Relay Satellites that bring NASA the Shuttle voice, data and video transmissions, enable Columbia to provide equivalent commercial services to its customers. It describes the process by which a small business entered the international communications arena, while NASA and the taxpayers recovered revenues not otherwise anticipated.

TDRSS - Building the System

The original procurement of the TDRSS provided for six spacecraft, each having both government frequency and commercial frequency payloads. Built by TRW, the TDRSS satellites were constructed under this concept. Each spacecraft contained both Western Union's, Advanced WESTAR C- and Ku-Band payloads as well as NASA's S- and Ku-Band payloads. The C-Band payload can be operated independently of all the other payloads. However, some of the NASA Ku-Band payload equipment is shared by the commercial Ku-Band payload and, therefore, full simultaneous operation of both Ku-Band payloads is not feasible. Figure 1 presents the overall spacecraft configuration.

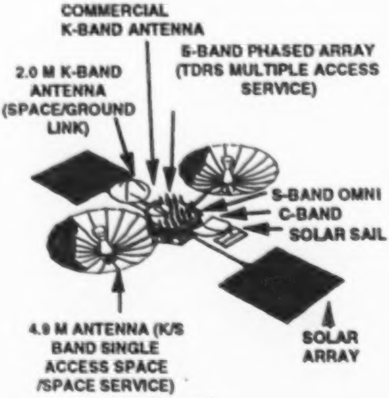
COMMERCIAL K-BAND ANTENNA
S-BAND PHASED ARRAY (TDRS MULTIPLE ACCESS SERVICE)
2.0 M K-BAND ANTENNA (SPACE/GROUND LINK)
S-BAND OMNI
C-BAND
SOLAR SAIL
4.9 M ANTENNA (K/S BAND SINGLE ACCESS SPACE /SPACE SERVICE)
SOLAR ARRAY

Figure 1
TDRSS Spacecraft

The TDRSS spacecraft are part of a three satellite Space Network relay system which provides

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NASA with command, tracking and telemetry recovery services for low Earth orbiting satellites using a ground station centrally located in White Sands, New Mexico. The baseline configuration includes two geostationary TDRSS spacecraft positioned over the Atlantic and Pacific Oceans (41° and 174° West longitude, respectively), along with a centrally located spare. Figure 2 presents the Baseline configuration. The spacecraft presently making up this baseline constellation are TDRS-4 (Atlantic), TDRS-5 (Pacific) and TDRS-6 (spare). The older TDRSS spacecraft still in orbit are TDRS-1 (launched 1983) and TDRS-3 (launched 1988). Both these spacecraft have experienced partial failures and can no longer provide full services to NASA's community of users, but they continue to be used for testing and some mission specific purposes.

As a result of conflicts in the required dates of the services, NASA eventually bought out Western Union's share of the spacecraft, but did not change the spacecraft design. Thus, NASA found itself with a C-Band capability for which it had no requirements.

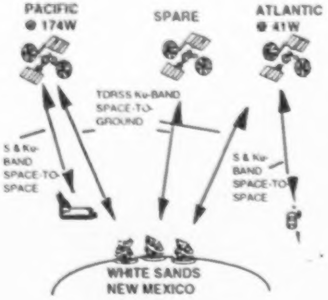

Figure 2
TDRSS Baseline Configuration

The C-Band Payload is Offered for Commercial International Use

NASA's world-wide operations include the Deep Space Network (DSN) ground facilities near Madrid, Spain. Antennas up to 70 meters in size communicate with and track missions such as Voyagers, Pioneers and the Interplanetary Cometary Explorer. In addition, the DSN plays an important role in providing contingency coverage to low Earth orbiting missions if they experience emergencies. NASA considered using the TDRSS C-Band to provide the vital transmission link between Madrid and the Jet Propulsion Laboratory in Pasadena, California. In anticipation of satisfying NASA's and other Government agencies' international communication needs, NASA reached an agreement with Systematics General Corporation (SGC) to provide for international services for Government users via the TDRSS C-Band, and SGC proceeded to submit a filing to the FCC. The requirements from other Government agencies never developed and NASA's minimal needs did not justify the cost associated with operating the TDRSS C-Band. Therefore, NASA dropped further consideration of using the capability.

In late 1988, Intelsat inquired regarding the possibility of leasing the TDRSS C-Band resources already in orbit positioned over the Atlantic and Pacific Oceans. Since the C-Band capability could be operated without interference or detriment to the primary NASA mission of acquiring data from missions like Shuttle, NASA considered the proposal as having merit in recovering some of the TDRSS costs for the U.S. taxpayers. NASA believed it could further increase the benefit to the taxpayers by offering the C-Band capacity through a bid process, thereby stimulating competition in the international communications industry. After discussions with the Federal Communications Commission (FCC) and Department of State, an announcement of NASA's intention to make the C-Band capacity available for International Telecommunications purposes appeared in the Commerce Business Daily of February 27, 1989. Eleven organizations responded to the inquiry, mostly potential users of very limited C-Band resources and, therefore, not primarily interested in leasing the full capacity of 24 transponders. However, responses included purveyors of international communications services, including Intelsat, Columbia and PanAmSat. On June 12, 1989, NASA released the solicitation package offering all 24 C-Band transponders, twelve each in the Atlantic and Pacific Ocean Regions (AOR, POR), for a period of up to six years. NASA would provide station keeping control to 0.1 degree in both longitude

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and inclination, and maintain the health and safety of the spacecraft bus. Operation and status monitoring of the C-Band payload would be the responsibility of the winning bidder. On July 7, 1989, NASA received three bids for the C-Band payload. The high bidder ($61.4 million) was Columbia Communications Corporation for a lease to cover a period of six years.

The Contractual Relationship

NASA sought a relationship that would enable the winning bidder to exercise independent control over the C-Band resources. NASA would fulfill the obligation of maintaining the geostationary positions and monitor the thermal and electrical conditions of the TDRSS spacecraft. The winning bidder, Columbia, would be responsible for satisfying FCC and foreign regulations and would be expected to meet its annual payment obligation to NASA. NASA would have no responsibility or authority in Columbia's execution of its business responsibilities, nor would it be involved in the setting of prices for services or approval of the customers seeking to lease the TDRSS C-Band transponders.

Columbia Communications Corporation : Background

The story of Columbia Communications is one of a small company fighting for years for the right to compete in a previously monopolized business, taking advantage of a unique opportunity to use previously launched government satellites to break into the market, and overcoming a series of regulatory and financial hurdles to get into the business successfully.

Columbia Communications Corporation is a Delaware corporation with principal offices in Honolulu, Hawaii and Bethesda, MD. Columbia was founded in 1983 by Hawaii businessman Clifford Laughton to engage in satellite communications. Mr. Laughton serves as the company's Chairman and CEO.

In the early 1980's, Mr. Laughton recognized that the healthy influence of competition in the U.S. domestic telecommunications market was not present in international telecommunications, which was dominated by Intelsat, an international consortium, and closed to private companies. In its early years, Columbia participated in a number of official U.S. regulatory proceedings, repeatedly urging the U.S. Government to permit competition in international satellite communications.

The efforts of Columbia and other aspiring private international service providers were rewarded in November 1984, when the White House issued a Presidential Determination that international satellite systems separate from Intelsat were required in the national interest. The Determination added that market competition would foster lower costs and innovative service offerings. By 1986, Columbia and seven other companies filed applications with the FCC for authority to construct and operate international satellite systems to compete with Intelsat. These applications, following the shift in U.S. policy, set the stage for the rapid development of competition which we have seen in recent years.

Columbia's application was granted in 1986 when it received from the FCC conditional authorization to build and launch a private, commercial satellite over the Pacific Ocean. However, Mr. Laughton's hopes of actively competing with Intelsat to provide international services progressed slowly until 1989, when NASA's offering of the TDRSS C-Band payload presented a unique opportunity to quickly enter the international marketplace. At the time NASA made public its decision to offer the C-Band capacity, Columbia realized that the TDRSS coverage areas were virtually identical to the service areas planned by Columbia in its initial applications. Columbia had already obtained a license for an orbital location over the Pacific, and its license application for an Atlantic orbital location was pending. Thus, TDRSS presented Columbia with the opportunity to acquire capacity on two government satellites (one of which was already launched and tested) at orbital positions coinciding with Columbia's long-term plans.

Columbia's $61 million bid to NASA for the TDRSS C-Band capacity was based on projections of future revenue flows, compared with estimated up-front costs that would include regulatory expenses in coordinating with Intelsat and obtaining foreign landing rights. Columbia anticipated that the TDRSS C-Band capacity would be attractive initially to radio and

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television broadcasters, and later to multinational companies and telecommunications carriers for the provision of private line voice and data services.

Early Difficulties

NASA's solicitation for bids on the TDRSS C-Band capacity included a paragraph stating that the award of the Agreement would be made only to a responsible prospective customer meeting substantially the same standards and procedures applied to a "Responsible prospective Contractor" in the Federal Acquisition Regulations. NASA officials were not satisfied with the material presented by Columbia and in August 1989, notified Columbia that is was not considered a responsible prospective customer. NASA then proceeded to coordinate with Intelsat as the second highest bidder for the TDRSS C-Band services, and entered into an agreement. C-Band testing was conducted by Intelsat and all 24 transponders were reported as performing properly. Operations were scheduled to begin before the end of 1989, when Columbia challenged NASA's award in court.

Columbia presented to the U.S. District Court, its claim that NASA had no right to make the final ruling on the company's ability to fulfill its lease agreement obligations with NASA. Instead, Columbia argued that NASA should have referred the issue to the Small Business Administration (SBA) since Columbia has standing as a U.S. small business. In January 1990, the court ruled in favor of Columbia, finding that NASA's long term lease offering did not excuse it from its obligation to refer the responsibility issue to the SBA. NASA took immediate action to terminate its agreement with Intelsat and forwarded the question of Columbia's responsibility to the SBA. In May 1990, the SBA certified that Columbia was responsible and, as such, was capable of performing the lease agreement. On June 8, 1990, NASA and Columbia signed the Agreement thereby concluding a difficult first phase of the effort.

Regulatory Requirements

In August 1990, Columbia applied to the FCC for a license to provide international satellite services in the Atlantic and Pacific regions using the TDRSS C-Band satellite capacity. The FCC put the request on file for public comment and no negative comments were filed.

At the same time, it became evident that the authorization process required of Columbia would need more time than the 6-month period allowed in the Agreement with NASA. NASA agreed to extend the 6-month period in exchange for Columbia paying NASA interest on the first lease payment for the months involved in the extension period.

After the Public Notice and comment period, the FCC notified the U.S. State Department and the Commerce Department that all three agencies would begin, on Columbia's behalf, the Intelsat consultation process required by U.S. law and Article XIV(d) of the Intelsat Agreement. The stated purpose of this consultation is to ensure that any new international satellite service does not interfere with Intelsat's existing or planned satellite services. The process assesses two primary factors: technical compatibility with Intelsat and the potential to cause significant economic harm to Intelsat.

In order to even begin the consultation process, Intelsat requires at least two of its "signatory" nations to support an applicant's request for permission to operate. In early 1991, the governments of the United Kingdom and Hong Kong joined the U.S. in supporting Columbia's application for the Atlantic and Pacific satellites, and the Intelsat consultation officially began in March 1991.

While Intelsat had no existing satellites which had major interference problems with the NASA satellites, the consultation was particularly difficult because Intelsat had filed in the mid-1980's for the right to use an orbital location for a future satellite directly on top of the NASA Atlantic satellite. If Intelsat put a C-Band satellite in that location, the two satellites' signals would cause enormous interference with each other and could not coexist. Intelsat argued that it had the right to plan its own satellite for that location and that it had filed first in time. The U.S. Government took the position that Intelsat's planned use of the slot in the future would prevent NASA from receiving income presently and in future years for use of the C-Band capacity, and would frustrate

U.S. policies to commercialize space and introduce competition for international satellite services. While these issues were being thrashed out, Hubbard Broadcasting and Western Systems provided financing which allowed Columbia to continue paying interest to NASA and to keep its lawyers and engineers at the table leading the fight for new competition.

In September 1991, after a long, contentious, and expensive negotiating process, the dispute was resolved in Columbia's favor. Columbia won the right to use the Atlantic location without interference from Intelsat for the full six-year lease term, and to use the Pacific location without interference for a full 10 years.

The difficulties of the consultation process stretched Columbia's staff and financial resources, and caused potential customers and investors to doubt that Columbia could successfully complete the process. By the end of the process, Columbia had not yet been able to finalize investor or user agreements to make its first annual lease payment to NASA by the deadline of October 15, 1991.

Following discussions between NASA and Columbia, NASA agreed to extend the deadline for up to six months and Columbia agreed to increase the lease payments during the lease term by an amount of between $2.5 and $10 million, depending on when the first lease payment would take place. With its major regulatory hurdle behind it, and with time to negotiate seriously with investors and customers, Columbia shifted gears from a regulatory focus to a commercial one.

Within the next few months, Columbia negotiated and signed a six-year multiple transponder lease with TRW Inc., making TRW its anchor tenant, and providing the financing needed for Columbia's first year of operations. TRW had decided to enter the international commercial satellite market in the Pacific region with its own satellite, and had filed an application with the FCC. The TDRSS capacity presented TRW with the opportunity to begin developing and testing the market in advance of the construction and financing of Pacificom.

During the Christmas period 1991, Columbia and TRW tested all 24 C-Band transponders on both satellites and received excellent results. On December 30, the FCC granted Columbia final authorization to inaugurate commercial service on both satellites, and the next day Columbia paid NASA the first annual lease payment of $10.7 million. At last, all the initial hurdles had been completed and Columbia proudly notified potential customers that it was ready, and able, to provide international satellite service to both the Atlantic and Pacific regions.

Operations Begin

Throughout 1992, NASA maintained both TDRSS spacecraft on station while Columbia sought the customer base to enable it to meet the next annual payment. Columbia arranged for the monitoring facilities to ensure compliance with the FCC requirements and concluded agreements with parties to facilitate the marketing of the transponders. However, the signing of customers did not go as smoothly as anticipated and it became apparent that Columbia would not have the accumulated revenue by December 31, 1992, to pay for the second year's operations. To mitigate the concerns of Columbia's potential customers, NASA agreed to provide continued services to paying customers that had signed long term leases with Columbia, even in the event of a failure of Columbia to meet its financial obligations. NASA and Columbia worked together to restructure the agreement and still satisfy NASA's objectives of: (1) not wasting valuable resources; (2) encouraging a small business enterprise in the competitive international communications arena; and (3) providing a financial return to the taxpayers for their investment in TDRSS. The solution arrived at was to establish a revenue sharing plan, fair to both NASA and Columbia, that would enable Columbia to move forward in its marketing efforts and ensure the U.S. Government a fair return from that endeavor. NASA is now receiving monthly revenue as a result of the revised agreement and Columbia is pursuing the leasing of transponders without the burden of meeting an annual payment schedule. Even though NASA and Columbia now share the revenue, the basic relationship remains unchanged; i.e. NASA is responsible for the spacecraft bus and Columbia is responsible for the C-Band payload services.

C-Band Payload

The C-Band payload consists of twelve 36 MHz wide transponders operating in a "bent pipe" mode similar to the WESTAR series of satellites. The payload is composed of a deployed "shaped beam" reflector antenna and a 12-channel repeater. Signals are received through an offset-fed parabolic dish antenna in the 5.925 to 6.425 GHZ frequency band on linear, vertical polarization. The signals are then amplified and frequency translated to the 3.7 to 4.2 GHZ frequency band and broadcast via the same antenna on linear, horizontal polarization utilizing 5.5 Watt TWTAs. The frequency assignments for the twelve channels are shown in Table 1.

Table 1
C-Band Frequency Assignments

CHANNEL NUMBER	RECEIVE FREQUENCY (MHz)	TRANSMIT FREQUENCY (MHz)
1	5927-5963	3702-3738
2	5967-6003	3742-3778
3	6007-6043	3782-3818
4	6047-6083	3822-3858
5	6087-6123	3862-3898
6	6127-6163	3902-3938
7	6167-6203	3942-3978
8	6207-6243	3982-4018
9	6247-6283	4022-4058
10	6287-6323	4062-4098
11	6327-6363	4102-4138
12	6367-6403	4142-4178

The C-Band payload block diagram is shown in Figure 3. There are three antenna port interfaces, one for receive and two for transmit, which are connected via waveguide to the transponder. The C-Band signal is received through Port 1 of the C-Band antenna, filtered in a wideband Band Pass Filter and sent to the C-Band receiver. The receiver is internally redundant, and consists of a preamplifier, down converter, amplifier, and a hybrid which power divides the received signal and transmits it into two banks of input multiplexers. The even input multiplexers separate the six even-numbered channels, while the odd multiplexers separate the six odd-numbered channels. A harmonic filter and isolator interface with the two output ports which are combined in the antenna.

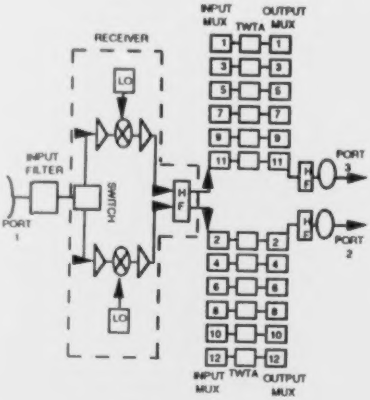
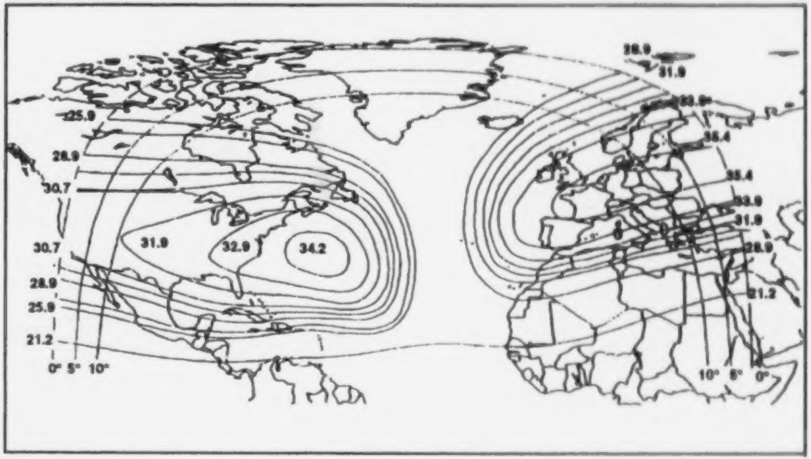


Figure 3
C-Band Payload Functional Block Diagram

Satellite Service Features

The C-Band antenna is a dual-mode shaped-beam antenna using a multihorn feed to illuminate a paraboloidal reflector. Each TDRSS satellite transmits and receives using a single shaped coverage beam, enabling it to span the ocean and provide peak performance on the continental land masses. The transmit EIRP contours and receive G/T contours for both the Atlantic and Pacific satellites are shown in Figures 4 and 5. Note that, as all transponders operate at fixed gain, the Saturation Flux Density (SFD) can be derived directly from the G/T values using the relationship: SFD = (-89.1) - G/T.


25.9
28.9
30.7
30.7
28.9
25.9
21.2
0° 5° 10°
31.9
32.9
34.2
28.9
31.9
33.9
35.4
35.4
33.9
31.9
28.9
21.2
10° 5° 0°

Transmit EIRP (dB) and Elevation

Fig. 4 Caption overleaf

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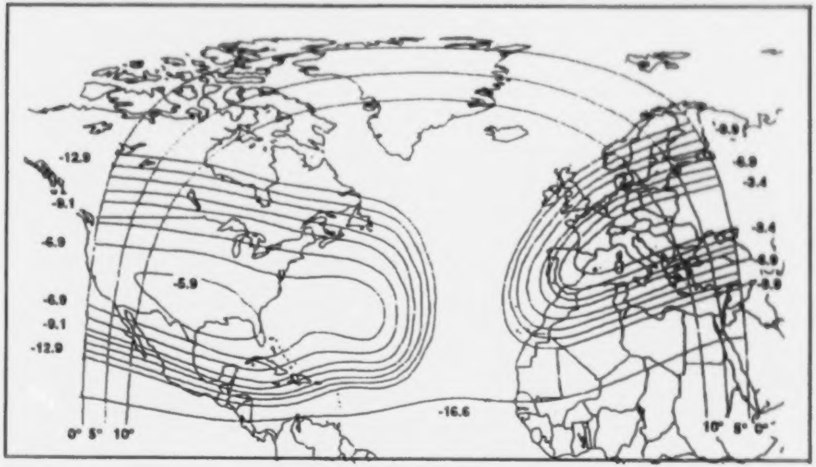
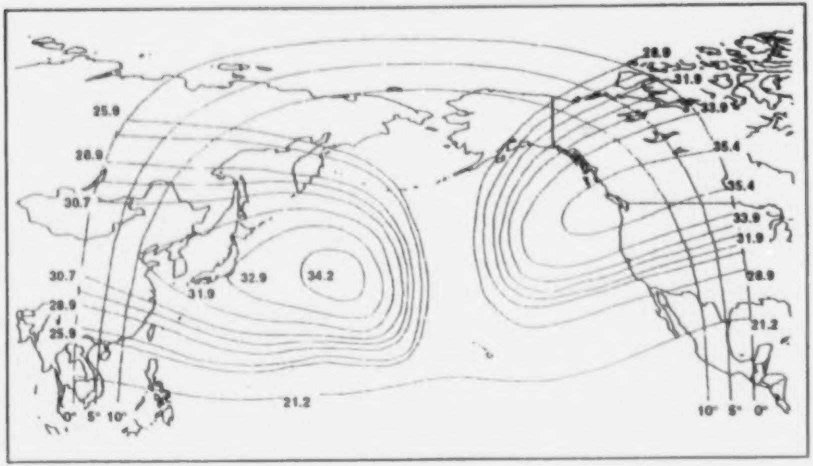

-12.9
-9.1
-6.9
-5.9
-6.9
-9.1
-12.9
-16.6
0° 5° 10°
-9.1
-6.9
-3.4
-3.4
-6.9
-9.1
10° 5° 0°

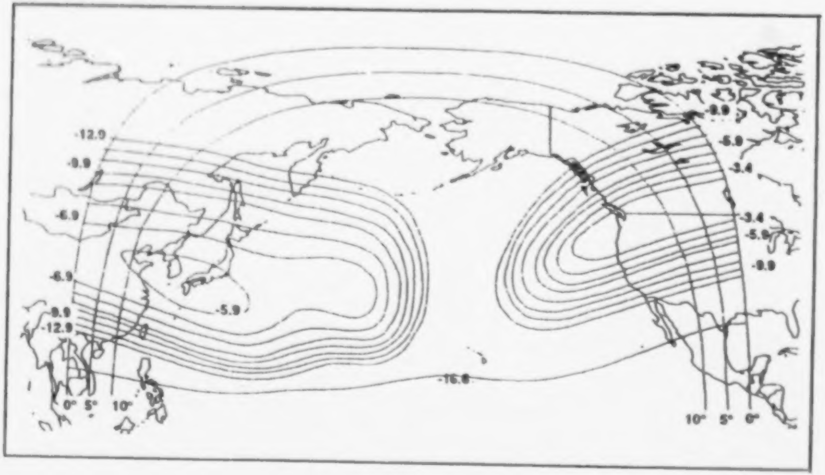
Receive G/T (dB) and Elevation

Figure 4
Atlantic C-Band Coverage Contours


25.9
28.9
30.7
30.7
28.9
25.9
31.9
32.9
34.2
21.2
0° 5° 10°
28.9
31.9
33.9
35.4
35.4
33.9
31.9
28.9
21.2
10° 5° 0°

Transmit EIRP (dB) and Elevation

Fig. 5 Caption overleaf.


-12.9
-9.9
-6.9
-6.9
-9.9
-12.9
-5.9
-15.9
0° 5° 10°
-9.9
-6.9
-3.4
-3.4
-5.9
-9.9
10° 5° 0°

Receive G/T (dB) and Elevation

Figure 5
Pacific C-Band Coverage Contours

The "broadcast" nature of the TDRSS satellite beams (single uplink beam and single downlink beam on each satellite) provide for the simplest network configurations - all points within each coverage can communicate with all other points by accessing a single transponder. This feature is also extremely attractive from an operational point of view as it allows the uplink earth station to monitor the signal transmission from the satellite to ensure the link quality is as expected.

The "footprints" of the TDRSS satellites overlap in the central United States and Mexico, thus enabling Columbia to provide its customers single-system connectivity stretching from the Philippines north to Hong Kong, Taiwan, China, Japan, Korea and the Russian Far East, across the Pacific and throughout North America, crossing the Atlantic and covering all of Europe, including Eastern Europe, the Mediterranean and North Africa.

The high satellite EIRP and input sensitivity permit the cost-effective use of relatively small and inexpensive earth stations, typically in the region of 2.4 to 4.5 meters in many parts of the coverage area. In situations where small size of the earth stations is of utmost importance, techniques are available to reduce the earth station antenna size to less than one (1) meter.

Columbia - Present and Future

Since commencement of operations 2 1/2 years ago, Columbia has come a long way. It now has landing rights in 27 countries and has assembled an international network of teleports with large earth stations looking at the TDRSS satellites.

In the United States, there are now over 15 teleports looking at the TDRSS satellites. Across the Atlantic, Columbia's primary gateway is London Teleport International, and a number of other teleports are being developed and licensed to look at TDRSS in France, Germany, Ireland, Sweden, and Finland. In the Pacific, TDRSS earth stations are in place in Hawaii, Japan, and Korea. Additional earth stations are planned in the near term in the Philippines, Guam, and Hong Kong.

Columbia introduced its SkyWay family of Services earlier this year, which it believes are the most competitively priced in the industry. SkyWay Services include the following:

1. Skyway Video - This service provides high-quality, full-time or occasional, digital or analog video services. Skyway Video is Columbia's most popular service and is used to provide regular broadcasting services to the major U.S. networks as well as the British Armed Forces. This summer, Columbia leased 6 full transponders to carry World Cup broadcasts from the United States to Europe and Asia. Columbia also carried a 45 Mbps high definition video signal for France Telecom to broadcast the finals of the World Cup in High Definition Television to Europe.

2. Skyway Information - This private line service provides various sized duplex circuits for private line networks. This service provides customers the economic benefits of the TDRSS C-Band system while eliminating expenditures for capital equipment. This is accomplished by utilizing existing teleports and local exchange carriers for connections to the customer's premises.

3. Skyway End-to-End - This service is custom tailored to provide dedicated equipment and services to fit the end-to-end communications requirements of the customers. Earlier this year, Columbia announced an alliance with the Harris Corporation, one of the largest U.S. telecommunications equipment and service providers, to make SkyWay End-to-End services a reality. Harris has the expertise to design, install, and operate a complete system to work with the TDRSS satellites. This service is relied upon extensively for vital communication services throughout the Bosnia-Herzegovina area using 2.4 meter VSAT antennas.

4. Skyway Switched - This service provides voice and data circuits interconnected to the public switched network. At present, the Columbia system may provide 1,250 64 Kbps equivalent circuits per satellite for interconnection to the public switched network at both ends of the circuit. Using digital compression, the TDRSS

C-Band system can provide up to 5,000 voice circuits. There is no limit to the number of circuits that are interconnected on only one end of the circuit. As deregulation advances around the world, it is expected that the remaining interconnection restrictions in many countries will fade away.

For the immediate future, Columbia plans to continue aggressively marketing its SkyWay Services throughout the geographical coverage of the TDRSS satellites in Europe and Asia. Columbia is continuing to devote substantial resources toward expanding its network of international teleports and toward providing innovative, flexible services to its customers. Once the TDRSS satellite capacity is substantially filled, Columbia plans to construct and launch three of its own follow-on satellites to be located in the Atlantic, Pacific, and Indian Ocean regions.

Columbia's success has not come easy. It has required a great deal of perseverance and considerable assistance and cooperation from NASA. With the help and encouragement of NASA and the U.S. Government, Columbia has played and will continue to play a vital role in bringing competitive international satellite services to the Atlantic and Pacific Ocean regions. Many other companies will be following in Columbia's footsteps in the next few years, and the benefits of competition can be expected to spread throughout the world. Columbia is grateful to NASA for its support, and is proud to have had the opportunity to participate in the development of this new era in international communications.

NASA - The Future of TDRSS C-Band

The two TDRSS spacecraft presently serving Columbia's community of C-Band customers are TDRS-4 (AOR) and TDRS-5 (POR). They were launched in 1989 and 1991 respectively and both spacecraft are operating properly. Together, they satisfy the communication needs of NASA's low Earth orbiting S- and Ku-Band missions such as Hubble Space Telescope, Shuttle, etc., and Columbia's C-Band customers. Their projected lifetimes last through the duration of the present 6 year agreement. NASA's TDRS-6 is the most recent TDRSS spacecraft launched (1993). It was checked out and placed into a spare location for NASA's future use. TDRS-6 was the last of the initial series, and the last to carry C-Band. The next TDRSS spacecraft to be launched is TDRS-G (TDRS-7 after launch), scheduled for a Shuttle mission in 1995. TDRSS will be serving the needs of the NASA community into the next decade, providing the means of communicating with the Space Station.

The U.S. taxpayers are entitled to whatever benefits can be derived from TDRSS. While those benefits are obviously the ability to view near real-time pictures, taken by the Hubble Space Telescope, of comets impacting Jupiter and television coverage of Shuttle Astronauts recovering and repairing malfunctioning satellites, they also include the benefits of the NASA/Columbia TDRSS C-Band Agreement. Those are: (1) Columbia is now a factor in the international communications market; (2) the TDRSS C-Band resources are presently being used to carry television images, such as World Cup soccer matches, and other communications coverage to many countries; and (3) NASA and the taxpayers are now receiving monthly revenue from the use of the TDRSS C-Band.

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